SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 3
FEBRUARY 1, 1975

W75-01101 -- W75-01650

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

ANOMALOUS PROPERTIES OF SUPERCOOLED WATER. HEAT CAPACITY, EXPANSIVITY, AND PROTON MAGNETIC RESONANCE CHEMICAL SHIFT FROM 0 TO -38 (DEGREES),
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
C. A. Angell, J. Shuppert, and J. C. Tucker.
Journal of Physical Chemistry 1973, Vol 77, No 26, p 3092-3099. 4 fig, 2 tab, 39 ref. OWRT B-051-IND(6).

Descriptors: *Supercooling, *Thermal capacity, *Physical properties, Heat capacity, Temperature, Bonding, Chemical properties.
Identifiers: *Proton magnetic resonance, *Expansivity, Calorimetry.

Expectations of a rapidly increasing heat capacity for water at low temperature are confirmed by differential scanning calorimetry. Cp is found to rise very rapidly from 18 to 29 cal mol-1 deg-1 between -10 deg and the homogeneous nucleation temperature, -40 deg. Proton magnetic resonance chemical shift measurements suggest this behavior is associated with a cooperative acceleration in hydrogen bond strength or formation rate at low temperatures. It is shown that in light of these results the existence of vitreous waters which soften and crystallize near 150 K is paradoxical. To resolve the paradox the existence below the homogeneous nucleation temperature of a lambda-type transition similar to that encountered in liquid sulfur is postulated. Its origin is tentatively accounted for in terms of the cooperative bond lattice model. It is apparent that the positive volume change associated with hydrogen bond formation plays a dominant role in determining the observed constant pressure behavior on cooling, the positive volume change itself being a consequence of the geometry of formation of the four coordinate random network.
W75-01228

SURFACE HEAT LOSS FROM COOLING PONDS,
Massachusetts Inst. of Tech., Cambridge.
P. J. Ryan, D. R. F. Harleman, and K. D. Stolzenbach.
Water Resources Research, Vol 10, No 5, p 930-938, October 1974. 12 fig, 1 tab, 23 ref.

Descriptors: *Heat flow, Heat transfer, Cooling water, Specific heat, Wind velocity, Latent heat, Water temperature, Heat exchangers, Ponds, Convection, Evaporation, Equations, Surface waters.
Identifiers: *Heat loss, *Cooling ponds, Evaporative heat flux.

A technique was developed to account for the contribution of free convection to the evaporation from a cooling pond. Established formulas for forced (wind-driven) evaporation were corrected for convective effects and used in a formula for surface energy balance to estimate heat fluxes and surface temperatures of cooling ponds. The resulting expression for total heat loss agreed with observed cooling pond performance better than other formulas presently in use. Surface heat loss coefficients may be derived from the new heat loss formula for use in calculating temperature rises induced by heated discharges. The formulation of a theoretically based expression for free convective evaporation flux was a necessary improvement, especially for artifically heated water surface. (Roberts-ISWS)
W75-01296

1B. Aqueous Solutions and Suspensions

THE RIBOFLAVIN SENSITIZED PHOTOINACTIVATION OF ISOCITRIC DEHYDROGENASE,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W75-01384

2. WATER CYCLE

2A. General

INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBAN BASINS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-01124

ON THE TRANSFORMATION OF POINT RAINFALL TO AREAL RAINFALL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-01125

GROUNDWATER - BASEFLOW RELATIONSHIPS AND BASEFLOW PREDICTIONS FROM GROUNDWATER LEVELS ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-01127

THE HYDROLOGICAL CYCLE--HISTORICAL EVOLUTION OF THE CONCEPT,
Geological Survey, Raleigh, N.C.
R. L. Nace.
In: Contributions to the Development of the Concept of the Hydrological Cycle: UNESCO Report SC.74/CONF.804/COL.1, Paris, p 9-23, August 1974. 8 ref.

Descriptors: *Hydrology, *History, *Reviews, Water balance, Hydrologic cycle, Groundwater movement, Hydrogeology, Streamflow, Rainfall-runoff relationships, Water measurement.

The origins of the concept of the hydrological cycle are ancient but obscure. The complete concept of the hydrological cycle, stated in fully coherent terms, is a relatively modern development. The scientific awakening in Europe began during the fifteenth century, when men began to make instruments, measurements and deductions, rather than accepting ecclesiastical or Aristotelian authority. Leonardo da Vinci was a principal catalytic innovator at that time. Attitudes spread quickly northward and by the seventeenth century France was in the vanguard of scientific achievment. Scientific hydrology was born there but British thinkers also were becoming increasingly active and took a strong position in the eighteenth century. By the nineteenth century most of the advanced countries of the world were active in many aspects of the water cycle and were beginning to think in terms of continental and global phenomena. The twentieth century has witnessed a nearly universal awakening to the importance of the hydrological cycle and the evolution of much international collaboration. Hydrology may be on the verge of its Golden Age. (Knapp-USGS)
W75-01157

DEVELOPMENT OF HYDROLOGY IN NORTH AMERICA,
Geological Survey, Raleigh, N.C.
R. L. Nace.
In: Contributions to the Development of the Concept of the Hydrological Cycle: UNESCO Report SC.74/CONF.804/COL.1, Paris, p 85-98, August 1974. 40 ref.

Descriptors: *History, *Hydrology, *Reviews, *North America, Water balance, Hydrologic cycle, Groundwater movement, Hydrogeology, Streamflow, Rainfall-runoff relationships, Water measurement.

The history of hydrology in North America is briefly reviewed. Archaeological evidence discloses that the beginnings were ancient but do not approach the antiquity of beginnings in the Mediterranean and other regions of the Old World. For the historic period there is little of hydrological significance to record until about 300 years after European colonization of North America. In the United States early studies were largely in the field. Various studies during 1917-20 of lakes, canals and rivers were aimed chiefly at navigation problems. During nearly 75 years North American scientists have been in the vanguard of scientific hydrology. Most of the work has related to specific problems of water-resources development. Relatively little attention has been paid to hydrology on a continental scale. National weather services have assessed the balance between precipitation and evaporation. Runoff factors have also been measured and computed for much of the continent. (Knapp-USGS)
W75-01158

SIMULATIONS OF WATERSHED HYDROLOGY ON AGRICULTURAL WATERSHEDS IN VIRGINIA WITH THE STANFORD MODEL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
V. O. Shanholtz, and J. H. Lillard.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 508, $3.75 in paper copy, $2.25 in microfiche. Research Division Report 136, September 1971. 38 p, 24 fig, 2 tab, 7 ref, append. OWRT A-018-VA(5).

Descriptors: *Hydrologic models, *Streamflow forecasting, *Rainfall-runoff relationships, *Water yields, Infiltration, Overland flow, Flood routing, Base flow, Mathematical models, Duration curves, Water balance, Evapotranspiration, Hydrologic budget, *Virginia, *Agricultural watersheds.
Identifiers: *Stanford watershed model.

The effectiveness of the model for predicting streamflow from small agricultural watersheds was evaluated using two watersheds with contrasting hydrologic responses. Five years of historical records were used to evaluate model parameters and an additional five years was simulated for comparison. Water yield estimates were reasonably good. Instantaneous peak discharge estimates were quite erratic. Maximum daily peak flows were less erratic and maximum peak estimates for the water year had acceptable accuracy.
W75-01218

THEORETICAL DISCUSSION OF GROUNDWATER FLOW TOWARDS A SINK,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 2F.
W75-01241

A COMPARATIVE STUDY OF THE HYDROLOGY OF RABIATA PINE AND EUCALYPT FORESTS AT LIDSDALE, NEW SOUTH WALES,
New South Wales Dept. of Environment, Sydney (Australia).

For primary bibliographic entry see Field 2I.
W75-01250

FLOOD ESTIMATION IN EASTERN NEW SOUTH WALES - A DESIGN METHOD,
New South Wales Univ., Kensington, (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01256

EXTENSION OF ISRAEL'S NATIONAL WATER SYSTEM AS A FUNCTION OF ARTIFICIAL RAINFALL PROSPECTS,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel) Long Range Planning Sect.
E. Kally.
Water Resources Research, Vol 10, No 5, p 917-920, October 1974. 2 fig, 2 tab, 1 ref.

Descriptors: *Artificial precipitation, *Probability, Cloud seeding, Cloud physics, Rainfall, Decision making, Precipitation(Atmospheric), Water resources, Water harvesting.
Identifiers: *Precipitation enhancement, *Israel(Lake Kinneret).

The effect of cloud seeding to increase the water yield of Lake Kinneret and thus obtain water to extend the Israel National Water System was investigated. A second possibility was the reclamation of sewage effluents of the Dan region. The seeding experiment was based on comparing the amount of rainfall on 'seeded' days to that on 'unseeded' days, and depended on chance difference between the amounts of rainfall on any two days. It was concluded that the National Water System should be extended because the probability of no increase of water yields that would give equal justification to extending or not extending the system was 86%. This was higher than the no-increase probability indicated by the findings of the artificial rainfall experiments. For this reason, the policy to extend the system appeared to be preferable. (Roberts-ISWS)
W75-01297

DETERMINATION OF GROUNDWATER RECHARGE WITH TRITIUM,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2G.
W75-01299

A WATER BALANCE ASSESSMENT OF THE NEW ZEALAND RAINFALL,
New Zealand Meteorological Service, Wellington.
J. D. Coulter.
Journal of Hydrology (New Zealand), Vol 12, No 2, p 83-91, 1973. 2 fig, 3 tab, 7 ref.

Descriptors: *Water balance, *Rainfall, Precipitation(Atmospheric), Evapotranspiration, Soil moisture, Water demand, Vegetation, Irrigation water, Water supply, Runoff, Surplus water, Moisture deficit.
Identifiers: *New Zealand.

Daily rainfall data observed at representative New Zealand weather stations were used to produce a simple water balance analysis. This provided an approximation to the distribution of water surpluses and deficiencies with respect to the average seasonal water need. Water demand for vegetation was taken as the average rate of potential evapotranspiration for the month in question, as given by Thornthwaite's formula. If the available water over a period was insufficient to meet this demand, the amount by which it fell short was taken as a measure of water deficiency or irrigation requirement. Such periods when soil moisture was exhausted were termed days of 'agricultural drought' or 'days of soil dryness'. An arbitrary limit was chosen for soil moisture capacity, and actual evapotranspiration was considered to continue at the potential rate until the available soil moisture was depleted. Each day's rainfall was allocated towards the day's water need. Any remainder replaced soil moisture previously withdrawn from storage and then, provided a surplus for runoff. (Roberts-ISWS)
W75-01305

AN ASSESSMENT OF REMOTE SENSING APPLICATIONS IN HYDROLOGIC ENGINEERING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 7B.
W75-01312

DIGITAL SIMULATION LANGUAGE FOR DISTRIBUTED PARAMETER SYSTEM IDENTIFICATION,
California Univ., Los Angeles. Dept. of Computer Science.
For primary bibliographic entry see Field 7C.
W75-01321

THE ENERGY AND MOISTURE BUDGET OF THE URBAN INTERFACE AS AFFECTED BY CYCLONIC STORMS - PHASES I AND II,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W75-01398

CHARACTERISTIC BEHAVIOR OF COMPONENTS OF HYDROLOGIC CYCLE OF THE UNITED STATES,
Connecticut Univ., Storrs.
A. N. Shahane.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 685, $7.50 in paper copy, $2.25 in microfiche. Ph.D. dissertation, 1973. 547 p, 93 tab, 131 fig, 129 ref, append. OWRR A-033-CONN(2). 14-31-0001-3807.

Descriptors: *Hydrologic cycle, Behavior, *Drainage area, *Time series analysis, Precipitation(Atmospheric), Precipitable water, Runoff, Storage, United States, Evapotranspiration, Water vapor, Geological surveys, Statistical methods, Water balance, Hydrologic data, Meteorology.
Identifiers: *Mass balance, Atmospheric divergence, Isohyetal maps, Moisture flux.

A conventional water balance approach and a general statistical methodology are unified for evaluating components of the hydrologic cycle. Mass balance equations of terrestrial and atmospheric branches of the hydrologic cycle are used to estimate evapotranspiration and storage values for 76 drainage areas ranging in size from 20,000 to 58,000 sq. miles. Hydrologic components including precipitation, runoff, and atmospheric water vapor transport parameters are computed (from isohyetal maps, U.S.G.S. water supply papers, and maps for verically integrated moisture fluxes, respectively). These input parameters are then used in water balance equations and are subject to statistical analysis including autocorrelation, spectral and cross spectral density techniques, two-way analysis of variance, and simple correlation theory. Computations are carried out on an IBM 360 computer and an effort is made to identify the possible factors for spatial variation. The conclusions can be summarized as: (1) Using the hydrometeorological approach, a time series of 7 components of the hydrologic cycle is generated for 76 watershed areas of the U.S. (2) Synthetic time series on effects of statistical violation on final estimates helped in understanding some critical statistical points for the hydrologic time series. (3) Maps of meteorological and physical features correlated with statistical parameters of the hydrologic cycle.
W75-01400

WATER FOR THE HUMAN ENVIRONMENT, VOLUME 1, CONGRESS PAPERS.
International Water Resources Association, Champaign, Ill.
For primary bibliographic entry see Field 6B.
W75-01428

ADVANCED CONCEPTS AND TECHNIQUES IN THE STUDY OF SNOW AND ICE RESOURCES.
For primary bibliographic entry see Field 2C.
W75-01522

A PRELIMINARY WATER BALANCE EVALUATION OF AN INTENSIVE SNOW SURVEY IN A MOUNTAINOUS WATERSHED,
Atmospheric Environment Service, Calgary (Alberta).
D. Storr, and D. L. Golding.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 294-303, 1974. 3 fig, 2 tab, 17 ref.

Descriptors: *Snow surveys, *Water balance, *Demonstration watersheds, *Canada, Snowmelt, Water yield, Snowpacks, International Hydrological Decade.
Identifiers: *Marmot Creek Experimental Watershed(Canada).

Using water equivalent values from and intensive snow survey and subsequent precipitation as input, and measured streamflow calculated evaporation and calculated change in storage as output, a water balance from the time of the survey to the end of the snowmelt period has been attempted for each of the five years 1969-73 in Marmot Creek Experimental Watershed, Alberta. The net errors were less than 10% of the input values, but a bias in one or more of the components is suspected. (See also W75-01522) (Knapp-USGS)
W75-01549

BREAK-UP CHARACTERISTICS OF THE CHENA RIVER WATERSHED, CENTRAL ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W75-01572

STOCHASTIC HYDROLOGICAL SYSTEM MODELS (STOCHASTIKUS HIDROLOGIAI RENDSZER-MODELLEK),
K. Istvan.
Hidrologiai Kozlony, Vol 54, No 2, p 87-90, February, 1974. 6 fig, 18 ref.

Descriptors: *Hydrologic systems, *Runoff, Model studies, Flow, *Evaporation, Investigations, *Stochastic processes, Water yield.
Identifiers: Stochastic models, *Trickling.

A stochastic model of hydrological systems taking evaporation, trickling and runoff into consideration is presented. The input-output model of the catchment system is composed of three segments for atmospheric (precipitation and evaporation) and geologic (flows to and from the system) communications, and for water yield, such as, water leaving the catchment system. The probabilities at which a given quantity of water evaporates or runs off from the catchment system or remains within the latter during a given time are determined. The investigations indicate the reduction of the specific water yield with the increase of the catchment area. (Prague-FIRL)
W75-01645

2B. Precipitation

ON THE TRANSFORMATION OF POINT RAINFALL TO AREAL RAINFALL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
I. Rodriguez-Iturbe, and J. M. Mejia.
Water Resources Research, Vol 10, No 4, p 729-735, August 1974. 8 fig, 7 ref. OWRT-C-4118(No 9021)(5).

Descriptors: *Meteorology, *Rain, *Design, *Networks, Precipitation(Atmospheric), Model studies, Hydrologic data, Probability, Mathematical studies, Synthetic hydrology, Weather data, Hydrology, Estimating, Equations, Hydrologic equation, Rating curves, Cost analysis, Drainage area, Watersheds(Basins).
Identifiers: *Roche methodology, *Point rainfall, Transformation, Bessel function, Model testing, Catchment area.

A general methodology was developed for the transformation of point rainfall to areal rainfall. The reduction factor was shown to depend solely on the expected correlation coefficient between the point rainfall at two randomly chosen points in the area in consideration. The methodology can be used to characterize the input to rainfall-runoff models, and it included the case in which multiple inputs were used in the model in the form of a subdivision in modules of the whole catchment. An example was worked out discussing the different methodologies for the estimation of total mean volume of rainfall over an area. (Roberts-ISWS)
W75-01125

RADIOTELEMETRY OF HYDROMETEROLOGICAL DATA,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W75-01214

EAST AFRICAN RAINFALL: CENTRAL TENDENCIES AND SKEWNESS AS SYNOPTIC INDICATORS,
East African Meteorological Dept., Nairobi (Kenya).
R. C. Hills.
Weather, Vol 29, No 9, p 345-355, September 1974. 6 fig, 2 tab, 4 ref.

Descriptors: *Rainfall, *Climates, *Distribution patterns, Average, Wet seasons, Dry seasons, *Africa, Seasonal, Rainfall disposition, Precipitation(Atmospheric), Statistics, Statistical methods, Frequency analysis, Foreign countries.
Identifiers: Tanzania, Kenya, Lake Victoria.

The precipitation regime of East Africa was described with simple statistical procedures. These included the average model, and median precipitation and expanded into the mean of the logarithms and mean of square roots. It was found that the mean of the logarithms of the precipitation was the most informative in describing the frequency distribution. The precipitation population shape, especially in skewness, described the full range of conditions experienced during the period of record. The mechanisms that produced rain in East Africa seemed more diverse and complicated than was suggested by previous work. (Jones-ISWS)
W75-01293

EXTENSION OF ISRAEL'S NATIONAL WATER SYSTEM AS A FUNCTION OF ARTIFICIAL RAINFALL PROSPECTS,
Tahal Consulting Engineers Ltd., Tel Aviv (Israel) Long Range Planning Sect.
For primary bibliographic entry see Field 2A.
W75-01297

A WATER BALANCE ASSESSMENT OF THE NEW ZEALAND RAINFALL,
New Zealand Meteorological Service, Wellington.
For primary bibliographic entry see Field 2A.
W75-01305

THE ENERGY AND MOISTURE BUDGET OF THE URBAN INTERFACE AS AFFECTED BY CYCLONIC STORMS - PHASES I AND II,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 663, $3.25 in paper copy, $2.25 in microfiche. California Water Resources Center, Davis, Report UCAL-WRC-W-237, January 1973. 8 p. OWRR B-100-CAL(4) and B-121-CAL(5). 14-31-0001-3061 and 14-31-0001-3260 Amended.

Descriptors: *Climatology, Radiation, Cities, *Moisture, Cyclones, *Convection, Conduction, Evaporation, *Energy budget, Model studies, *California, Architecture, Ecology, *City planning, Storms.
Identifiers: Los Angeles(Calif), Urban climatology.

The objective was broadened from the modeling of one weather type (cyclones), to the construction of an all-weather process-response model of the input and output of the interface energy and moisture budget applicable to any city. This model simulates the urban absorption of solar radiation, longwave radiation, and the dissipation of this energy by the channels of convection, conduction, and evaporation. The concept of a system is introduced to relate the shadowing, multiple reflections, and energy exchange dependencies among city blocks. A city can have as many systems as there are adjacent blocks. The examination of a synthetic city, with varying latitudinal and seasonal radiation responses, indicates that urban heat islands are migrating phenomena and probably influence convective air circulation in the city. Downtown areas often absorb less energy than the periphery of the inner zone, and the mere existence of a city is sufficient to generate heat islands. The predictions of the model (clear condition) compared favorably with observations taken under typical urban situations. Research is continuing on the all-weather aspects of the model.
W75-01398

WORLD METEOROLOGICAL ORGANIZATION ACTIVITIES IN CENTRAL AMERICA,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 6E.
W75-01449

DEUTERIUM IN ROCKY MOUNTAIN SNOWPACKS,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2C.
W75-01536

TOPOGRAPHIC INFLUENCES ON SNOWFALL PATTERNS IN MOUNTAINOUS TERRAIN,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
J. O. Rhea, and L. O. Grant.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 182-192, 1974. 6 fig, 3 tab, 7 ref. USFS Contract 31-1371-2027.

Descriptors: *Snowfall, *Distribution patterns, *Topography, *Orography, Meteorology, Slopes, Winds, Colorado, Mountains, Alpine, Snowpacks, International Hydrological Decade.

Total snowfall in mountainous areas is the resultant of orographic lifting, large scale vertical motion, convection, and upstream barrier interception. The study utilizes data from a large number of snowcourses and nonrecording precipitation gages in Colorado and Utah, upper air soundings and maps, and local topographic maps. Topographic slope (which determines the magnitude of orographic vertical velocity for a given wind speed) is computed relative to a given precipitation measurement point over scale lengths corresponding to the scales over which snow crystals grow and fall out (10 km to 50 km). Time intervals considered range from 6 hours to long-term averages. The end objective of the study is to develop a technique which will improve the short term prediction of mountain snowfall and serve as a diagnostic aid in assessing areal distribution of snow water content on a seasonal cumulative basis (including assessments in ungaged areas). Preliminary results indicate that long-term snowcourse water equivalent distribution among points scattered throughout Colorado can be largely explained by systematic consideration of the directionally adjusted topographic slope which potential precipitation bearing winds must traverse on their last 20 km of approach to a given station, and the number of upstream barriers which the air must pass over. (See also W75-01522) (Knapp-USGS)
W75-01539

CLOUD DROPLET ACCRETION ON SNOW CRYSTALS,
Naval Weapons Center, China Lake, Calif.
R. F. Reinking.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 193-203, 1974. 3 fig, 2 tab. USBR Contract 14-06-D-6592.

Descriptors: *Snow, *Crystal growth, Freezing, Cloud physics, Snowfall, Snowpacks, Rime, Ice, Frost, Meteorology, California, Orography, International Hydrological Decade.
Identifiers: Sierra Nevada(Calif).

The formation of precipitation and the initial conditions of new snow on the ground can be studied by examining the nature of cloud droplet accretion on snow crystals. An empirical description of accretion on a population of snow crystals is presented. The modes of snow crystal growth in clouds reflect the efficiency of storm systems for producing precipitation and also determine the initial characteristics of snowpack. Snow crystal growth processes are therefore vital links in the physical systems which determine water supply and avalanche potential. Accretion on a population of snow crystals is empirically described. The degree of accretion is given in terms of crystal growth habit, size and growth time. The results are applicable to modeling of precipitation formation as well as densification and metamorphosis of newly fallen snow. (See also W75-01522) (Knapp-USGS)
W75-01540

MEASUREMENT OF SNOWFALL BY RADAR,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 7B.
W75-01559

AN ELECTRO-OPTICAL INSTRUMENT FOR MEASURING TOTAL PRECIPITATION AND SNOW PACK WATER CONTENT,
Bass Engineering, Inc., San Diego, Calif.
For primary bibliographic entry see Field 7B.
W75-01588

2C. Snow, Ice, and Frost

ICE SHEETS AND GLACIERS,
Geological Survey, Tacoma, Wash.
M. F. Meier.
In: Encyclopaedia Britannica, 15th Edition, p 175-186, 1974. 10 fig, 6 ref.

Descriptors: *Glaciers, *Ice, *Glaciology, Glaciation, Glaciohydrology, Reviews, Water balance, Scour, Erosion, Pleistocene epoch, Regimen, Movement, Deformation, Cryology.

Ice sheets and glaciers are briefly discussed. A glacier is a large mass of perennial ice that originates on land by the recrystallization of snow and that shows evidence of flow. Glaciers are classifiable in three main groups: (1) glaciers that extend in continuous sheets, moving outward in all directions, are called ice sheets or continental glaciers if they are the size of Antarctica or Greenland, and ice caps or ice fields if they are smaller; (2) glaciers confined within a path that directs the ice movement are called mountain glaciers; and (3) glaciers that spread out on level ground or on the ocean at the foot of glaciated regions are called piedmont glaciers or shelf ice. Glacier ice today stores about three-fourths of all the freshwater in the world, covers about 11 percent of the world's land area, and would cause a world sea-level rise of about 90 meters if all existing ice melted. Glaciers occur in all parts of the world and at almost all latitudes. Glacier runoff is an important source of water during dry periods and regulates the flow of large rivers, thus compensating for extremes of precipitation. Mountain glacier erosion produces the spectacular U-shaped valleys, serrated ridges, and Matterhorn-like peaks that are the basis of the great beauty of Alpine scenery. The products of this erosion are deposited as moraines that form rich agricultural soil. (Knapp-USGS)
W75-01167

REMOTE SENSING AND SNOWPACK MANAGEMENT,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. I. Linlor.
Journal of the American Water Works Association, Vol 66, No 9, p 553-558, September 1974. 7 fig, 18 fig.

Descriptors: *Snowpacks, *Water resources, *Remote sensing, Aircraft, Electromagnetic waves, Snow surveys, Frequency, Microwaves, Density stratification, Snow cover, Water yield, Water equivalent, Electrical conductance, Gravitational water, *Snow management, Surveys, Testing procedures, Instrumentation, Depth.
Identifiers: Reflected signals, Dielectric constant.

An active electromagnetic transmitter and receiver were described that steps through a series of frequencies to measure signals received from a snowpack to be translated into depth of snow, density of snow, and wetness of snow. The system would complement the existing snow surveys with greater coverage and more frequent determinations of these variables. A preliminary system was tested over snow and found to give reasonable results. Further testing is planned over natural snow fields with comparison against samples selected from those fields. A passive microwave or radiometer system for snowpack surveillance was also described. (Jones-ISWS)
W75-01294

LOW REYNOLDS NUMBER SUBLIMATION OF BLOWN SNOW,
Wyoming Univ., Laramie. Water Resources Research Inst.
J. Nydahl, and K. Pell.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 513, $3.75 in paper copy, $2.25 in microfiche. Completion Report, (1974). 35 p, 20 fig, 24 ref. OWRT A-013-WYO(1).

Descriptors: *Snow management, *Snowpacks, *Reynolds number, *Model studies, Mathematical models, *Sublimation, Heat transfer, Mass transfer, Humidity, Temperature, Solar radiation, Atmospheric pressure.
Identifiers: *Snow particle transport.

The use of artificial snow control devices to induce drifting on windswept watersheds or at reclamation sites may become important considerations in snow pack management. One critical factor in determining the capacity of such a system is the transport distance of the snow particles. The transport distance of blow snow is very difficult to measure in the field and is a strong function of the terrain and local environment. It is therefore very desirable to formulate sublimation models to predict idealized transport distances and to study the influence that various environmental variables have on this distance. In a 1972 research paper entitled 'Sublimation of Wind-Transport Snow--A Model', R. A. Schmidt presents a mathematical model to estimate the sublimation rate of blown snow over a horizontal surface (see W73-00953). This report is intended to supplement this paper by making some improvements in the fluid dynamics and heat and mass transfer used in this model and to use the model to calculate effective transport distances in various environments. An improved analytical model is presented, accepting the premise that the sublimation rate of snow particles held in turbulent suspension can be calculated from a free fall model and accurate determination of the terminal free fall Reynolds number. The sublimation rates of ice crystals in various environments and the sensitivity to various physical parameters are discussed for: i. density of the particle; ii. solar radiation; iii. temperature; iv. relative humidity; and v. atmospheric pressure. Two models are presented to calculate the amount of wind transported snow reaching a fence. The first model assumes that all the particles leave the ground with some critical size and the second model assumes there is some known steady state distribution during blowing events. The experimental data generated will be useful in a stochastic model being formulated, since relatively little information exists in the literature for unsteady heat and mass transfer at these low Reynolds numbers. Preliminary theoretical results indicate that the sublimation rate of small ice spheres may be increased by approximately 30% by the turbulent intensities generated by a strong wind.
W75-01337

HUNGRY HORSE CLOUD SEEDING PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 3B.
W75-01347

FLOW OF BLUE GLACIER, OLYMPIC MOUNTAINS, WASHINGTON, U.S.A.,
Geological Survey, Tacoma, Wash.
M. F. Meier, W. B. Kamb, C. R. Allen, and R. P. Sharp.
Journal of Glaciology, Vol 13, No 68, p 187-212, 1974. 10 fig, 5 tab, 24 ref.

Descriptors: *Glaciers, *Washington, *Rheology, Ice, Movement, Shear, Flow, Deformation, Glaciology, Ablation, Regimen.
Identifiers: *Blue Glacier(Washington).

Velocity and strain-rate patterns in a small temperate valley glacier display flow effects of channel geometry, ice thickness, surface slope, and ablation. Surface velocities of 20-55 m/year show year-to-year fluctuations of 1.5-3 m/year. Transverse profiles of velocity have the form of a higher-order parabola modified by the effects of flow around a broad bend in the channel, which makes the velocity profile asymmetric, with maximum velocity displaced toward the outside of the bend. Marginal sliding rates are 5-22 m/year against bedrock and nil against debris. Velocity vectors diverge from the glacier centerline near the terminus, in response to surface ice loss, but converge toward it near the firn line because of channel narrowing. Plunge of the vectors gives an emergence flow component that falls short of balancing ice loss by about 1 m/year. Centerline velocities vary systematically with ice thickness and surface slope. In the upper half of the reach studied, effects of changing thickness and slope tend to compensate, and velocities are nearly constant; in the lower half, the effects are cumulative and velocities decrease progressively downstream. Where the slope increases downstream from 7 to 9 deg, reflecting a bedrock step, there is localized longitudinal extension of 0.03 per year followed by compression of 0.08 per year where the slope decreases. Marginal shear is strongly asymmetric due to flow around the bend: the stress centerline, where one of the principal axes becomes longitudinal, is displaced 150 m toward the inside of the bend. This effect is prominently visible in the crevasse pattern. Ice fluxes calculated independently by 'laminar' flow theory and by continuity disagree in a way which shows that internal deformation of the ice is controlled not by local surface slope but by an effective slope that is nearly constant over the reach studied. (Knapp-USGS)
W75-01364

ADVANCED CONCEPTS AND TECHNIQUES IN THE STUDY OF SNOW AND ICE RESOURCES.
Proceedings of Interdisciplinary Symposium held at Asilomar Conference Grounds, Monterey, California, December 2-6, 1973: National Academy of Sciences Washington, DC, 1974. 789 p.

Descriptors: *Snow, *Ice, *International Hydrological Decade, *Data collections, *Instrumentation, Conferences, Runoff forecasting, Flood forecasting, Water management(Applied), Telemetry, Data transmission, Mathematical models, Hydrologic data, Research and development.

The Interdisciplinary Sympsoium on Advanced Concepts and Techniques in the Study of Snow and Ice Resources was a forum at which persons involved in the study of snow and ice could discuss measurement techniques with representatives of other technical fields. The Symposium was designed to acquaint people working on one aspect of the snow and ice field with recent needs and developments concerning its other aspects. The four areas of discussion are: (1) the expanding needs of water resource managers for snow and ice information; (2) the major characteristics of snow and ice that must be measured, or that affect measurement systems; (3) observational systems for snow and ice measurement, data accumulation, and information dissemination; (4) new concepts and techniques from other fields that may be applicable to measurement problems in snow and ice. The specific objectives of the Symposium are to: (1) explore the possible impact of new technology on the study and management of snow and ice resources, especially in the area of measurement, data accumulation, and information dissemination; and (2) explore the application of those techniques that may benefit the study and management of snow and ice resources. (See also W75-01523 thru W75-01595) (Knapp-USGS)
W75-01522

SNOW LOAD ANALYSIS AND RECREATIONAL USES OF SNOW DATA,
Soil Conservation Service, Reno, Nev.
D. W. McAndrew.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Acade-

my of Sciences, Washington, DC, p 11-21, 1974. 8 fig, 11 ref.

Descriptors: *Snow surveys, *Loads(Forces), *Skiing, *Wintersports, Snowfall, Snow cover, Meteorology, Ice loads, Weight, Snow, Snow management, Data collections, International Hydrological Decade.
Identifiers: *Snow loads.

The weight of snow that accumulates on a building roof or structure must be estimated to determine the strength requirements necessary to prevent unacceptable strain on the structure or its collapse. The snow data that provide a reliable tool for forecasting streamflow also provide information on snow loads and are important in evaluating winter recreation site potential. Snow load information is presented by the Soil Conservation Service either by county or multicounty graphs delineating smaller areas with the same snow load within a county. These two methods are explained with examples in Nevada and Oregon. (See also W75-01522) (Knapp-USGS)
W75-01523

SNOWPACK AND RELATED TRENDS IN MOUNTAINS OF THE SOUTHWESTERN UNITED STATES,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
G. L. Pearson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 22-29, 1974. 7 fig, 2 ref.

Descriptors: *Snow surveys, *Climatology, Snowpacks, Utah, Statistics, *Southwest US, Snow cover, Runoff, Snowmelt, Data collections, Hydrologic data, International Hydrological Decade.

Analysis of mountain snowpack in mountains of the southwestern United States indicates a changing climate and major variability within relatively short geographic distances. Four snow courses indicate a longtime downward trend in which the average water content just prior to 1969 had become about equal to that experienced during the severe drought of the early 1930's. It was near a third to a half of what it had been during the period from 1912 to 1923. The last 5-year period from 1969 to 1973 indicates a possibility that this trend may soon reverse. This same trend may be going on in the San Joaquin basin of southern California. (See also W75-01522) (Knapp-USGS)
W75-01524

POLAR REGION SNOW STRATIGRAPHY TECHNIQUES APPLIED TO COMMERCIAL PROBLEMS,
Mitre Corp., Bedford, Mass.
W. W. Vickers, M. E. Lopez, and J. Branch.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 30-38, 1974. 4 fig, 3 ref.

Descriptors: *Snowpacks, *Winter sports, *Snow cover, Forecasting, Climatology, Stratigraphy, Snowfall, Runoff forecasting, Snow surveys, Snowmelt, Data collections, Hydrologic data, Climatic data, International Hydrological Decade.
Identifiers: Snow stratigraphy.

Stratigraphic characteristics of snow reflect the weather conditions producing them. Planning a proposed ski resort required a survey of environmental conditions of a remote peak for which no previous historical data existed. A stratigraphic analysis of sections straddling the peak was used to forecast snowpack, and the utility of stratigraphic information from the snowpack is illustrated. Experimental work from a second project in Yellowstone National Park, tracing stratigraphy, illustrates the usefulness of this technique for measuring snow accumulation for large snow courses, particularly where sensitive measurements of cloud seeding are being sought. (See also W75-01522) (Knapp-USGS)
W75-01525

NEW CONCEPTS IN SNOW SURVEYING TO MEET EXPANDING NEEDS,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
For primary bibliographic entry see Field 7B.
W75-01526

LONG-RANGE GOAL AND INFORMATION NEEDS OF THE COORDINATED SNOW SURVEY PROGRAM IN CALIFORNIA,
California Cooperative Snow Surveys, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 7C.
W75-01527

ON PREDICTING WATER RUNOFF FROM A SNOW COVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 55-66, 1974. 2 fig, 12 ref.

Descriptors: *Snowmelt, *Snow cover, *Runoff forecasting, *Remote sensing, Streamflow forecasting, Telemetry, Saturated flow, Unsaturated flow, Infiltration, Snow surveys, Snowpacks, Data collections, Hydrologic data, International Hydrological Decade.

Use of remote sensing techniques with the theory of water flow through snow should improve methods for predicting water runoff from snow-covered watersheds. The flow through snowpacks occurs in two layers with different characteristics and mathematical descriptions. First, vertical seepage through the upper layers of unsaturated snow occurs followed by flow through a saturated layer at the base of the snowpack. Measurements of density and liquid water volume as functions of depth are necessary to provide an initial condition for calculation of flow through the unsaturated layer. In addition, the water flux across the surface must be known either from direct measurements or forecasts of meteorological parameters. Knowledge of the porosity and permeability of the saturated layer must be obtained from direct measurements of the ice content in order to calculate flow through that layer. For short term forecasts, it may be sufficient to know the thickness of the saturated layer, but for forecasts of more than a few hours, the influx from the overlying snow must also be known. Only measurements of the dielectric properties by remote sensing can provide the necessary information. Such a system is possible with current technology. (See also W75-01522) (Knapp-USGS)
W75-01528

THE OCCURRENCE AND MOVEMENT OF LIQUID WATER IN THE SNOWPACK,
National Inst. of Scientific Research, Quebec.
E. J. Langham.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 67-75, 1974. 7 fig, 5 ref.

Descriptors: *Snowmelt, *Melt water, Water yield, Ice, Tracers, Snowpacks, Slopes, Runoff forecasting, Percolation, Infiltration, Water storage, International Hydrological Decade.

The flow of melt water in snowpacks containing ice layers was observed using colored ice crystals. Snowpacks of various slopes were studied. Water content and flow were measured at the same time. Horizontal or concave ice layers can impound melt water, thus increasing the capacity of the snow to store water. Both horizontal and sloping ice layers divert the flow of meltwater and thus considerably increase the time of passage of the water through the snow. (See also W75-01522) (Knapp-USGS)
W75-01529

HYDROLOGY OF WARM SNOWPACKS AND THEIR EFFECTS UPON WATER DELIVERY--SOME NEW CONCEPTS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
J. L. Smith.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 76-89, 1974. 1 fig, 2 tab, 18 ref.

Descriptors: *Snowmelt, *Snowpacks, *Temperature, Heat transfer, Melting, Soil water movement, Climatology, Forests, Water yield, Research and development, Reviews, International Hydrological Decade.

The hydrology of warm snowpacks differs from that of cold snowpacks largely because of climatic differences. A number of new theories about the hydrology of warm snow, developed from studies at the U.S. Forest Service's Central Sierra Snow Laboratory, are at variance with older and generally accepted theories. Soil temperature appears to have little effect on snowmelt because melt or rain water from the pack keeps the soil cool and minimizes vapor transfer of heat. Snow temperatures remain near the freezing point in all but the surface few inches in most years. Snowmelt and water movement from the pack occur throughout most winters regardless of pack density, but density layering and differential maturation of the snowpack will materially affect water movement. Differences in the amount of snow found in contiguous forest and open sites appear to be largely the result of differential aerodynamic placement. Snow interception and subsequent evaporation from tree crowns are probably a source of only minor losses. (See also W75-01522) (Knapp-USGS)
W75-01530

ABLATION CHARACTERISTICS OF AN ALPINE SNOWFIELD IN SUMMER,
Forest Service (USDA), Provo, Utah. Intermountain Forest and Range Experiment Station.
L. R. Bartos, and P. A. Rechard.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 90-98, 1974. 2 fig, 9 ref.

Descriptors: *Ablation, *Snowpacks, *Wyoming, Alpine, Mountains, Snowmelt, Snow cover, Topography, Water equivalent, Water yield, International Hydrological Decade.

Ablation characteristics of a summer alpine snowfield in the Klondike Lake area, Medicine Bow Mountains, Wyoming, were investigated. The mean summer ablation rate was 6.00 cm/day. The total change in volume of water in the snowfield was determined using mean surface ablation and area-elevation relationship. Physical characteristics of the subsurface snow, such as snow

density, and free water content were also evaluated. (See also W75-01522) (Knapp-USGS)
W75-01531

EVAPORATION FROM SNOWDRIFTS UNDER OASIS CONDITIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard, and C. N. Raffelson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 99-107, 1974. 1 fig, 4 tab, 6 ref.

Descriptors: *Snowmelt, *Evaporation, *Water balance, Water yield, Mountains, Snowpacks, Snow management, Wyoming, Snow cover, Winds, Water equivalent, Runoff forecasting, International Hydrological Decade.

It is possible to modify snow accumulation patterns by utilizing artificial wind barriers such as snow fences. However, economical utilization of the snowdrifts requires that the resultant increase in water supply be obtained at a reasonable cost. To forecast the quantity of increased water supply it is necessary to know the amount of water lost from the drift through evaporation. A study to measure evaporation was conducted on Pole Mountain in southeastern Wyoming. Two snowdrifts were formed on top of butyl rubber mats behind snow fences, each 8 feet high and 100 feet long. The water equivalents of the drifts were determined, and the quantity of runoff from the melting of the drifts was measured. Evaporation during the 1-month ablation period was approximately 20%-30% of the volume of the drift at the start of ablation. During the melt season the snowdrifts are oases of snow, in that they are surrounded by bare ground. Because of this fact, and the extreme wind packing of the snow, existing models to compute evaporation are not adequate. (See also W75-01522) (Knapp-USGS)
W75-01532

APPLICATION OF THE ENERGY BUDGET FOR PREDICTING SNOWMELT RUNOFF,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
D. M. Gray, and A. D. J. O'Neill.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 108-118, 1974. 1 fig, 4 tab, 13 ref.

Descriptors: *Runoff forecasting, *Snowmelt, *Energy budget, Solar radiation, Heat transfer, Grasslands, Soil moisture, *Canada, International Hydrological Decade.
Identifiers: *Bad Lake Research Watershed(Sask-Can).

Energy budget calculations were made during the snowmelt period in 1972 at the Bad Lake Research Watershed in Saskatchewan, Canada. Three separate situations were examined--the energetics of snowmelt for continuous snowcover, the case of an isolated, late-lying snow patch, and the melt process on a small treeless basin. On the prairies, net radiation is the dominant energy source for snowmelt at the beginning of melt and the amount of sensible heat transfer progressively increases in importance as bare ground appears. For a small watershed, definition of source areas of melt runoff and adjustments to the net radiative flux to account for slope and aspect are essential when attempting to relate energy budget predictions to the measured basin discharge. (See also W75-01522) (Knapp-USGS)
W75-01533

THERMO-OSMOTIC SOIL MOISTURE TRANSFER UPON FREEZING,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
A. R. Jumikis.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 119-134, 1974. 3 fig, 27 ref. NSF Grants G-1968, G-6577 and GK-1294.

Descriptors: *Soil water movement, *Freezing, *Frost action, *Soil moisture, Osmosis, Mass transfer, Heat transfer, Porous media, International Hydrological Decade.

The natural phenomenon of thermo-osmosis has its most conspicuous manifestation in the upward migration of soil water in fine-particled, frost-prone soils from higher energy levels to lower ones brought about by freezing of soils. Thermo-osmosis is of great importance as a means of explaining and understanding the phenomenon of freezing of highways, airfields, earth dams, and the foundations of cold-storage structures. An analytical derivation is given for the physical and mathematical relationship governing the induces electrical (ionic) potential in soil with thermo-osmosis. (See also W75-01522) (Knapp-USGS)
W75-01534

THE ECOSYSTEM CONCEPT FOR DETERMINING THE IMPORTANCE OF CHEMICAL COMPOSITION OF SNOW,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
J. W. Hornbeck, and G. E. Likens.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 139-151, 1974. 5 fig, 12 ref.

Descriptors: *Water chemistry, *Snowpacks, *Chemistry of precipitation, *Ecosystems, New Hampshire, Nutrients, Precipitation(Atmospheric), Calcium, Nitrates, Sulfates, Potassium, Forests, Snowmelt, Streamflow, International Hydrological Decade.

The chemical composition of the snowpack was determined throughout the winter of 1972-73 in the Hubbard Brook Experimental Forest, New Hampshire. The importance of the snowpack was evaluated in relation to chemical inputs to the forest ecosystem and to chemical outputs in streamflow. The snowpack was slightly less acid and had about the same or lower concentrations of calcium, nitrate, and sulfate than incident precipitation. Potassium occurred in higher concentrations in the snowpack than in precipitation, possibly as a result of leaching from organic matter incorporated in the snowpack. Just before spring melt the snowpack contained about 50% of the total calcium and 25% of the total nitrate and sulfate input to the ecosystem in winter precipitation. Potassium in the snowpack just before melt was nearly twice the amount of input by winter precipitation. For all four ions the amount stored in the snowpack was small in relation to the amount lost in streamflow. The ecosystem concept is readily adaptable for determining the importance of the chemical composition of snow. (See also W75-01522) (Knapp-USGS)
W75-01535

DEUTERIUM IN ROCKY MOUNTAIN SNOWPACKS,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
J. R. Meiman, I. Friedman, and K. Hardcastle.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 152-160, 1974. 2 fig, 2 tab, 16 ref.

Descriptors: *Snowpacks, *Deuterium, *Rocky Mountain region, Tracers, Montana, Wyoming, Colorado, Climatology, Snowcover, Distribution patternsn, Precipitation(Atmospheric), International Hydrological Decade.

Deuterium was analyzed in 85 snowpack cores taken as part of the April 1 snow survey in seven regions of Montana, Wyoming, and Colorado. Mean regional deuterium content ranged from -13.3% (relative to Standard Mean Ocean Water) in the San Juan Mountains of southwestern Colorado to -18.3% in the Bighorn Mountains of Wyoming. The average coefficient of variation within regions was 4%. Stations in three regions gave varying degrees of differences for the years 1971 and 1972. The results suggest that stable isotope composition of snow can be regionalized for studies to increase understanding of snow hydrologic processes. (See also W75-01522) (Knapp-USGS)
W75-01536

MEASUREMENT OF ALBEDO OVER POLAR SNOW AND ICE FIELDS USING NIMBUS-3 SATELLITE DATA,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 7B.
W75-01537

ELEVATION AND METEOROLOGICAL CONTROLS ON THE DENSITY OF NEW SNOW,
Colorado State Univ., Fort Collins.
L. O. Grant, and J. O. Rhea.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 169-181, 1974. 3 fig, 2 tab, 9 ref. Grant GA-26401.

Descriptors: *Snowpacks, *Density, *Mountains, *Colorado, *Weather modification, Temperature, Statistics, Winds, Water equivalent, Cloud seeding, International Hydrological Decade.

New-fallen mountain snow density over three closely spaced Colorado mountain passes was studied in relation to causal factors (chiefly the vertical temperature profile of the precipitating cloud, windflow, and station elevation). Snow densities were compared for a subset of the data encompassing approximately half of the events which were affected by weather modification. Snow data for this study were collected at daily intervals throughout 11 winter seasons from the fall of 1959 through the spring of 1970 over a dense network of stations near Climax, Colorado. Station elevations range from 7,800 ft msl to 11,300 ft msl. Snow densities observed ranged from < 0.02 g per cc to > 0.15 g per cc. A statistically significant dependency of new snow density was calculated on geographic location, upper wind direction and speed, temperature regime, and weather modification. For a given mountain pass, density decreased with increasing elevation. Overall mean density was between 0.08 and 0.09 gm per cc. A parabolic relationship of density with 700 mb temperature was found. When 700 mb temperatures are adjusted to a reference level 2,500 ft above station elevation, the temperatures at which minimum densities are observed corresponds well with the dendritic crystal growth range. (See also W75-01522) (Knapp-USGS)
W75-01538

TOPOGRAPHIC INFLUENCES ON SNOWFALL PATTERNS IN MOUNTAINOUS TERRAIN,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.

W75-01539

CLOUD DROPLET ACCRETION ON SNOW CRYSTALS,
Naval Weapons Center, China Lake, Calif.
For primary bibliographic entry see Field 2B.
W75-01540

THE I.H.D. WORLD GLACIER INVENTORY,
Department of the Environment, Ottawa (Ontario). Glaciology Div.
C. S. L. Ommanney.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 204-212, 1974. 23 ref.

Descriptors: *International Hydrological Decade, *Surveys, *Glaciers, Glaciology, Mapping, Water balance, Climatology, Data collections, Basic data collections, Hydrologic data, International Hydrological Decade.

The progress of the worldwide glacier inventory being compiled as an I.H.D. program is reviewed. Aspects requiring new or improved techniques are discussed. The world inventory is, potentially, one of the most comprehensive regional studies or perennial ice and snow. If the required basic data is furnished by all countries with glacierized areas, it will be able to provide detailed information about every permanent snow and ice feature in the world. (See also W75-01522) (Knapp-USGS)
W75-01541

ICE THICKNESS AND VARIABILITY ON SILVER LAKE, GENESEE COUNTY, MICHIGAN: A RADAR APPROACH,
Environmental Research Inst. of Michigan, Flint.
M. L. Bryan.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 213-223, 1974. 5 fig, 1 tab, 12 ref. NSF Grant GI-30027.

Descriptors: *Lake ice, *Iced lakes, *Radar, *Michigan, *Remote sensing, Ice cover, Lakes, Water levels, Surveys, Data collections, Hydrologic data, International Hydrological Decade.
Identifiers: *Silver Lake(Mich).

Lake ice variations were measured using remote sensing instruments over a small midlatitude lake. During February and March 1972, Silver Lake, Michigan was studied for ice thickness, ice type (classified as black and white ice), and the spatial distribution of both over the lake. The survey grid was 100 ft, which would give a reasonable indication of the variations to be expected. Several radar images of the lake are presented to illustrate the technique. Continuing studies of remote sensor signatures and the interaction of electromagnetic energy with the earth's interface should increase the utility of these instruments for similar ice and snow studies. (See also W75-01522) (Knapp-USGS)
W75-01542

CHANNELS IN ICE,
Montana Univ., Missoula.
L. G. Browman.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 224-234, 1974. 7 fig, 2 tab, 13 ref. OWRR A-045-MONT(2).

Descriptors: *Ice, *Lake ice, *Ice cover, *Slush, *Snow cover, Montana, Freezing, Porous media, Crystal growth, Iced lakes, International Hydrological Decade.

The formation of slush between the ice covering freshwater lake surfaces and overlying dry snow is usually attributed to the upward movement of water through sizable cracks and holes in the ice. However, study of a mid-latitude freshwater mountain lake in western Montana shows that minute channels in the apparently solid ice are the primary source of the slush-forming water when the ice is covered by heavy snow. This phenomenon is temperature-dependent, occurring in the ice samples studied only between -0.8 deg C and 0.0 deg C. The channels develop originally at the ice grain boundaries. Other channels may form during mild spells from the fusion (largely along crystal boundaries) of air bubbles that are expelled during freezing. The decrease in ice density that occurs as winter progresses can be interpreted to suggest concurrent increase in the degree of channelization and enlargement of existing channels. (See also W75-01522) (Knapp-USGS)
W75-01543

ICE AND ICEBREAKERS,
Coast Guard Research and Development Center. Groton, Conn.
N. A. Ehrlich, and J. P. Welsh.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 235-243, 1974. 5 fig, 16 ref.

Descriptors: *Ice, *Sea ice, *Navigation, *Lake ice, *Remote sensing, Data collections, Physical properties.
Identifiers: *Icebreakers.

U.S. Coast Guard ice and icebreaking research is reviewed. Some examples of the problems encountered in obtaining measurements of the physical properties of ice for engineering use are discussed. The Coast Guard ice research program is concerned with the identification and quantification of the physical properties of ice which affect ship transit. Physical properties, such as the flexural strength, coefficients of static and kinetic friction, density, thermal characteristics of the ice column, and the areal distribution and thickness, are investigated. The Coast Guard conducted experiments with the Side Looking Airborne Radar (SLAR) to obtain information on the spatial distribution of sea ice features and for iceberg detection. The major advantage of SLAR for obtaining information is its all-weather capability. This is particularly advantageous for iceberg detection off the Grand Banks of Newfoundland. (See also W75-01522) (Knapp-USGS)
W75-01544

CLASSIFICATION OF SEA ICE RIDGING AND SURFACE ROUGHNESS IN THE ARCTIC BASIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, and S. J. Mock.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 244-254, 1974. 6 fig, 3 tab, 11 ref.

Descriptors: *Ice, *Sea ice, *Arctic, Profiles, Surveys, Topography, Remote sensing, Data processing, International Hydrological Decade.
Identifiers: *Pressure ridges(Sea ice), Lasers.

Classification schemes for sea ice pressure ridging are reviewed. Using these classification schemes the number of ridges above any height may be predicted. Processed laser profile data flown over the arctic ice pack in November 1970 illustrates the agreement between models and observation. The key parameter is the ratio of number of ridges per kilometer above height to the ridge height distribution parameter, uniquely determined by the mean ridge height. Ridging intensity correlates well with surface roughness throughout the frequency range. Sea ice pressure ridge height and spacing distributions can be automatically obtained from airborne laser profiles using digital data reduction techniques. (See also W75-01522) (Knapp-USGS)
W75-01545

SEA ICE: SCALES, PROBLEMS AND REQUIREMENTS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. F. Weeks, W. D. Hibler, III, and S. F. Ackley.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 255-267, 1974. 4 fig, 21 ref.

Descriptors: *Sea ice, *Data collections, *Ice, *Ice cover, Cryology, Remote sensing, Laboratory tests, Satellites(Artificial), Surveys, Telemetry, Reviews, International Hydrological Decade.

Sea ice can be examined on a variety of spatial scales that range over 10 orders of magnitude. Each scale of observation has its characteristic types of problems and these problems have associated requirements for new observational systems and techniques that are necessary for their resolution. Some of the more important problems and requirements of each scale are reviewed. The microscale is distinguished by the great importance of changes in the growth conditions on the structure of the resulting ice and the controlling effect of these structural variations on its small scale (<10 m) property variation. The greatest need is for compact instrumentation that is capable of rapidly specifying, by nondestructive methods, the internal state of the sea ice. Instrumentation to accomplish most aspects of mesoscale experimentation exists. The mesoscale is the natural scale for the utilization of remote sensing systems operated from aircraft. The most important equipment development problem in mesoscale studies is the lack of an instrument that remotely measures ice thickness. Most macroscale (>100 km) has to be provided by satellite-based remote sensing systems coupled with arrays of data buoys sited in the ice. Progress in arctic data buoy development is quite encouraging. (See also W75-01522) (Knapp-USGS)
W75-01546

THE ARCTIC AND SUBARCTIC SEASONAL SNOWPACK: RESEARCH AND MANAGEMENT APPROACHES IN ALASKA,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
C. W. Slaughter, and A. G. Crook.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 273-282, 1974. 23 ref.

Descriptors: *Snowpacks, *Arctic, *Snow cover, *Data collections, *Alaska, Snow management, Temperature, Heat transfer, International Hydrological Decade, Energy budget, Mass transfer, Runoff forecasting, Permafrost, Frozen ground, Ecology, Recreation, Winter sports, Snow surveys.

The seasonal snowpack of Arctic and Subarctic regions differs from that of temperate regions in several ways, including persistence (six to ten months of continuous snow cover), snowpack

density (0.05 to 0.35 g/cc in taiga regions, and up to 0.55 g/cc in tundra regions), and intensive depth hoar development. Basic data concerning amounts, timing, and areal disposition of snowfall are exceedingly sparse, yet indispensable for evaluation of the snow resource. Information on snowpack metamorphism and melt processes is lacking. Data are needed for research into ablation processes and meltwater yield over frozen soils (perafrost); snowpack metamorphism under steep vapor pressure gradients, minimal solar radiation input, and limited reworking by wind; the role of vapor transfer at the snow/air interface; and seasonal snowpack influence on local environments in relation to animal habitat, plant succession, and permafrost regimen. Study of snowpack management opportunities should include regulation of snow accumulation, redistribution, and ablation for such ends as water supply augmentation, streamflow regulation, drift control, site rehabilitation enhancement, and improvement of snow-based recreation. Obtaining snow data in a harsh winter environment is a basic concern; conventional snow survey techniques should be supplemented by such advances as real-time telemetry, utilization of satellite-based imagery, and radioisotope snow gages. (See also W75-01522) (Knapp-USGS)
W75-01547

SURFACE MEASUREMENTS OF SNOW AND ICE FOR CORRELATION WITH DATA COLLECTED BY REMOTE SYSTEMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 7B.
W75-01548

A PRELIMINARY WATER BALANCE EVALUATION OF AN INTENSIVE SNOW SURVEY IN A MOUNTAINOUS WATERSHED,
Atmospheric Environment Service, Calgary (Alberta).
For primary bibliographic entry see Field 2A.
W75-01549

A DATA COLLECTION AND REDUCTION SYSTEM FOR SNOW ACCUMULATION STUDIES,
Department of the Environment, Ottawa (Ontario) Glaciology Div.
For primary bibliographic entry see Field 7C.
W75-01550

ESTIMATING TRUE BASIN SNOWCOVER,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
H. Steppuhn, and G. E. Dyck.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resource--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 314-328, 1974. 3 fig, 9 tab, 12 ref.

Descriptors: *Snow cover, *Snowpacks, *Snow surveys, *Variability, *Runoff forecasting, Terrain analysis, Frequency analysis, Canada, Sampling, Statistics, Statistical methods, Water equivalent, International Hydrological Decade, Heat budget.

Accurate estimates may be made of the mean depth, density and water equivalent of the snowcover on a basin. Measurements in Canada indicate consistent similarities in the areal variations of snowcovers within areal units having similar landscape features. Localities within the same climatic region tend to accumulate snow according to recurring patterns unique to specific terrain and land use. Snow samples collected within similar areal units usually exhibit similar frequency distributions. These results, combined with the observation that snowcover variance for density is consistently lower than for depth, form the base for a ready, but statistically valid, method of estimating true snow water-equivalents. The method is operationally orientated and features flexibility depending on data requirement, funding and desired level of confidence. (See also W75-01522) (Knapp-USGS)
W75-01551

A NEW CALIFORNIA DEPARTMENT OF WATER RESOURCES TELEMETRY SYSTEM,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7B.
W75-01552

A REAL-TIME DATA NETWORK FOR AVALANCHE FORECASTING IN THE CASCADE MOUNTAINS OF WASHINGTON STATE,
Washington Univ., Seattle. Geophysics Program.
For primary bibliographic entry see Field 7B.
W75-01553

AVALANCHE HAZARD EVALUATION AND PREDICTION IN THE SAN JUAN MOUNTAINS OF SOUTHWESTERN COLORADO,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
R. L. Armstrong.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 346-355, 1974.

Descriptors: *Avalanches, *Snowpacks, *Colorado, *Data collections, Weather modification, Meteorological data, Instrumentation, Snow surveys, Snowfall, Research and development, International Hydrological Decade.

A study of the causes of snow avalanches in the San Juan Mountains of southwestern Colorado is intended to develop a forecast model to predict avalanches. The project also evaluates the possibilities of increased avalanche activity from winter cloud seeding activities. The specific research methodology of the San Juan Avalanche Project is described with particular attention given to studies regarding the physical and stratigraphic properties of the snowpack. A network of fixed instrumentation is utilized to measure meteorological parameters, determine certain physical properties within the snowpack, and detect avalanche events. The primary snow study site is located at Red Mountain Pass (3400 m) and includes instrumentation providing such basic information as air temperature, temperatures within the snowpack, wind speed and direction, precipitation rate and amount, snow settlement rate, and net all-ways radiation at the snow surface. In addition, an isotopic profiling snow gage provides snow density and water equivalent values throughout the snowpack at 1.0 cm intervals. An experimental network of seismic and infrasonic instrumentation was maintained during the first two winters of research in order to determine the value of such equipment as avalanche event recorders. In addition, trip wires have been installed in the paths of frequently occurring avalanches in order to acquire accurate event times. (See also W75-01522) (Knapp-USGS)
W75-01554

THE COMPUTER AS AN AID IN AVALANCHE HAZARD FORECASTING,
Avalanche Control Consultants, Olympia, Wash.
For primary bibliographic entry see Field 7C.
W75-01555

ICE INFORMATION COLLECTION, DISSEMINATION AND USES ON THE GREAT LAKES,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
For primary bibliographic entry see Field 7C.
W75-01556

MODERN DEMANDS ON THE CANADIAN ICE ADVISORY SERVICE,
Atmospheric Environment Service, Downsview (Ontario). Ice Forecasting Central.
For primary bibliographic entry see Field 7B.
W75-01557

USE OF RADAR TECHNIQUES FOR SEA ICE MAPPING,
Kansas Univ., Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W75-01558

MEASUREMENT OF SNOWFALL BY RADAR,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 7B.
W75-01559

APPLICATION OF SLAR FOR MONITORING GREAT LAKES TOTAL ICE COVER,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W75-01560

LAKE ONTARIO SNOWFALL OBSERVATIONAL NETWORK FOR CALIBRATING RADAR MEASUREMENTS,
National Weather Service, Silver Springs, Md.
For primary bibliographic entry see Field 7B.
W75-01561

AIRBORNE PROFILING OF ICE THICKNESS USING A SHORT PULSE RADAR,
Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W75-01562

CONTINUOUS SEA AND FRESH WATER ICE THICKNESS PROFILING USING AN IMPULSE RADAR SYSTEM,
Geophysical Survey Systems, Inc., North Billerica, Mass.
For primary bibliographic entry see Field 7B.
W75-01563

THE ROLE OF SATELLITES IN SNOW AND ICE MEASUREMENTS,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7B.
W75-01564

SOME NEW SATELLITE MEASUREMENTS AND THEIR APPLICATION TO SEA ICE ANALYSIS IN THE ARCTIC AND ANTARCTIC,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 7B.
W75-01565

APPLICATION OF SATELLITE VISIBLE AND INFRARED DATA TO MAPPING SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 7C.
W75-01566

SNOW STUDIES USING VISIBLE AND INFRARED MEASUREMENTS FROM EARTH SATELLITES,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 7B.
W75-01567

DETECTION OF BURIED GLACIAL AND GROUND ICE WITH THERMAL INFRARED REMOTE SENSING,
State Univ. of New York Coll. at Geneseo.
For primary bibliographic entry see Field 7B.
W75-01568

HYDROLOGIC CHARACTERISTICS OF SNOW-COVERED TERRAIN FROM THERMAL INFRARED IMAGERY,
Defense Mapping Agency Topographic Center, Washington, D.C.
For primary bibliographic entry see Field 7B.
W75-01569

REMOTE SENSING APPLICATIONS IN CANADIAN ICE RECONNAISSANCE,
Department of the Environment, Downsview (Ontario).
For primary bibliographic entry see Field 7B.
W75-01570

APPLICATION OF THERMAL IMAGERY TO THE DEVELOPMENT OF A GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 7C.
W75-01571

BREAK-UP CHARACTERISTICS OF THE CHENA RIVER WATERSHED, CENTRAL ALASKA,
Alaska Univ., College. Geophysical Inst.
G. Wendler, R. Carlson, and D. Kane.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 523-531, 1974. 8 fig, 10 ref. NASA Grant NAS5-21833.

Descriptors: *Ice breakup, *Remote sensing, *Monitoring, *Aerial photography, Satellites(Artificial), Floods, Snowmelt, Snow cover, Snowpacks, Data collections, Hydrologic data, Model studies, International Hydrological Decade, *Alaska.
Identifiers: *Chena River(Alaska), *ERTS.

The snowmelt in a small watershed (5130 sq km) in Central Alaska was monitored with ERTS imagery. Aerial photography was used as supporting data for periods without satellite coverage. Comparison both with actual measurements and with a computer model showed good agreement. This model is based on calculation of energy fluxes at the surface and within the snowpack. Cloudiness is used to estimate the radiative fluxes, temperature and wind speed to estimate the sensible heat flux, and dew point and wind speed to calculate the latent heat flux. Also the process of melting at the surface and refreezing at deeper layers in the snowpack is considered. (See also W75-01522) (Knapp-USGS)
W75-01572

TECHNIQUES FOR DETERMINING AREAL EXTENT OF SNOW IN THE SIERRA NEVADA MOUNTAINS USING HIGH ALTITUDE AIRCRAFT AND SPACECRAFT IMAGERY,
California Univ., Berkeley. Center for Remote Sensing Research.
For primary bibliographic entry see Field 7B.
W75-01573

POLAR SEA ICE OBSERVATIONS BY MEANS OF MICROWAVE RADIOMETRY,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W75-01574

MICROWAVE SIGNATURES OF SNOW AND FRESH WATER ICE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W75-01575

MESOSCALE DEFORMATION OF SEA ICE FROM SATELLITE IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 7B.
W75-01576

AN EXPERIMENTAL GAMMA-RAY SPECTROMETER SNOW SURVEY OVER SOUTHERN ONTARIO,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W75-01577

AREAL SNOWPACK WATER-EQUIVALENT DETERMINATIONS USING AIRBORNE MEASUREMENTS OF PASSIVE TERRESTRIAL GAMMA RADIATION,
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 7B.
W75-01578

MEASUREMENT OF SNOW AT A REMOTE SITE: NATURAL RADIOACTIVITY TECHNIQUE,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 7B.
W75-01579

NATURAL GAMMA SPECTRAL PEAK METHOD FOR SNOW MEASUREMENT FROM AIRCRAFT,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 7B.
W75-01580

UTILITY OF ISOTOPE PROFILING SNOW GAGE FOR WATER MANAGEMENT,
Booneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 7B.
W75-01581

NUCLEAR TECHNIQUES FOR SNOW AND ICE STUDIES IN CANADIAN SUBPOLAR REGIONS (DEVON ISLAND),
Canada Center for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W75-01582

USE OF THERMOLUMINESCENT DOSIMETERS FOR STUDIES OF THE SNOW COVER,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
For primary bibliographic entry see Field 7B.
W75-01583

DEVELOPMENT AND FIELD TESTING OF A REMOTE RADIOISOTOPIC SNOW GAGE,
JRB Associates Inc., La Jolla, Calif.
For primary bibliographic entry see Field 7B.
W75-01585

ANALYSIS OF SNOW DISTRIBUTION USING TERRESTRIAL PHOTOGRAMMETRY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7B.
W75-01586

CONCEPTUAL DESIGN OF A MULTIPURPOSE INSTRUMENT FOR WINTER STREAM METERING,
Canada Center for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W75-01587

AN ELECTRO-OPTICAL INSTRUMENT FOR MEASURING TOTAL PRECIPITATION AND SNOW PACK WATER CONTENT,
Bass Engineering, Inc., San Diego, Calif.
For primary bibliographic entry see Field 7B.
W75-01588

MEASURING SNOWFALL, A CRITICAL FACTOR FOR SNOW RESOURCE MANAGEMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 7B.
W75-01589

THE SNOW MOISTURE INTEGRATOR,
Michigan Technological Univ., Houghton.
For primary bibliographic entry see Field 7B.
W75-01590

ELECTRONIC MEASUREMENTS OF SNOW SAMPLE WETNESS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 7B.
W75-01591

MICROWAVE PROFILING OF SNOWPACK FREE-WATER CONTENT,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 7B.
W75-01592

METEOR BURST COMMUNICATION,
Boeing Co., Seattle, Wash.
For primary bibliographic entry see Field 7B.
W75-01593

DIELECTRIC CONSTANTS IN THE MANAGEMENT OF FREEZING SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
A. R. Jumikis.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 753-764, 1974. 4 fig.

Descriptors: *Remote sensing, *Electrical studies, *Cryology, Microwaves, Radar, Frozen ground, Frozen soils, Frost, Soil moisture, Temperature, Data collections, International Hydrological Decade.
Identifiers: *Dielectric constants.

In snow and ice studies and in the case of calculating the temperature of the land surface by means of spaceborne remote sensors the dielectric constants of the air, snow, ice and soil must be known. Because each material has its own individual dielectric constant (a property of the material), an important decision must be made as to what frequency to use for determining the dielectric constant, whether low, high, microwave frequen-

cy, or that of a molecular vibration frequency of the particular material. The dielectric constant data on soil, water, snow and ice should facilitate agreement between the observed and theoretically calculated quantities not merely in soil mechanics, but also in snow and ice hydrology. (See also W75-01522) (Knapp-USGS)
W75-01594

ELECTRICAL PARAMETERS OF SOME FROST-PRONE SOILS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
A. R. Jumikis, and W. A. Slusarchuk.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 765-781, 1974. 4 tab, 30 ref.

Descriptors: *Electrical studies, *Soil physical properties, Remote sensing, Cryology, Microwaves, Radar, Frozen ground, Frozen soils, Frost, Soil moisture, Temperature, Data collections, International Hydrological Decade.
Identifiers: *Dielectric constants.

The dielectric constant and conductance of frost-prone soils are sensitive to temperature, water content, porosity of the soil and to the electrical frequency applied to the soil sample. The dielectric constants of the bulk soil, of the solids and of the water film increase with an increase in temperature, with a decrease in soil porosity and with a decrease in frequency. Also the dielectric constant of the bulk soil increases with an increase in water content. Just as the dielectric constant is sensitive to temperature, frequency, water content and porosity, so is the electrical conductance. (See also W75-01522) (Knapp-USGS)
W75-01595

CHEMICAL COMPOSITION OF AN ANTARCTIC SNOW PROFILE,
Bergen Univ. (Norway). Geofysisk Institutt.
Y. T. Gjessing, and E. T. Gjessing.
Vatten. 29(3): 233-237, Illus. 1973.
Identifiers: Aerosols, *Antarctic, *Chemical composition, Human pollution, Snow profiles, Sulfur, Sulfates.

During 1970-71, snow samples were collected each 30 cm from a 10 m profile in the Antarctic. The 10 m snow layer is estimated to be 25 yr old. Comparing the mean concentration of the different components analyzed in the upper 5 m with that of the lower showed that, except for sulfate and a few other elements, there was a significant concentration increase with depth. This phenomenon might be explained by the snow profile acting as a filter for aerosols. The results showed a concentration decrease of sulfate with depth, which suggests that the content of sulfur brought into the atmosphere by man has increased in Antarctica during the last decades.--Copyright 1974, Biological Abstracts, Inc.
W75-01597

2D. Evaporation and Transpiration

THERMAL STRATIFICATION BY RADIATION IN SURFACE LAYERS OF STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W75-01101

WATER NEEDS OF FLORIDA CITRUS,
Florida Univ., Gainesville. Committee on Water Needs for Citrus.
For primary bibliographic entry see Field 3F.
W75-01222

MEASURE OF WATER STRESS IN CITRUS,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 3F.
W75-01223

LOSSES OF NUTRIENTS IN DRAINAGE WATER FROM A MATURE PEACH ORCHARD,
Florida Univ., Gainesville. Dept. of Fruit Crops.
For primary bibliographic entry see Field 3F.
W75-01224

A COMPARATIVE STUDY OF THE HYDROLOGY OF RABIATA PINE AND EUCALYPT FORESTS AT LIDSDALE, NEW SOUTH WALES,
New South Wales Dept. of Environment, Sydney (Australia).
For primary bibliographic entry see Field 2I.
W75-01250

SURFACE HEAT LOSS FROM COOLING PONDS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 1A.
W75-01296

BASIC DIFFICULTIES IN PREDICTING EVAPORATION,
Heidemaatschappij Beheer N.V., Arnhem (Netherlands). Research Dept.
L. Wartena.
Journal of Hydrology, Vol 23, No 1-2, p 159-177, 1974. 3 fig, 1 tab, 36 ref.

Descriptors: *Evaporation, *Energy transfer, Vapor pressure, Water vapor, Physical properties, Evapotranspiration, Lysimeters, Model studies, Heat transfer, Potential flow, Measurement, Physical properties.
Identifiers: Vapor transport, Bowen ratio, Surface energy balance.

It is extremely difficult to measure or estimate evaporation rates under natural conditions even though much progress has been made in understanding and measuring evaporation. Local instantaneous evaporation is well defined from a physical viewpoint. Integration with respect to time and place in order to arrive at evaporation rates for extended periods of time is generally impossible. This problem was overcome by introducing so called characteristic evaporation values. The importance of reliable and direct measurements of natural evaporation was pointed out. Some experimental results obtained through application of the energy balance method, combined with direct measurement of the turbulent flux of sensible heat, were presented. (Roberts-ISWS)
W75-01300

SURVEY OF NEW ZEALAND TANK EVAPORATION,
New Zealand Meteorological Service, Wellington.
J. Finkelstein.
Journal of Hydrology (New Zealand), Vol 12, No 2, p 119-131, 1973. 4 fig, 5 tab, 7 ref.

Descriptors: *Evaporation, *Evaporimeters, Evaporation pans, Reservoir evaporation, Weather data, Humidity, Surveys, Measurement, Meteorology, Equations.
Identifiers: *Tank evaporation, *New Zealand, *Penman equation.

A 1961 survey of open-water evaporation from tank evaporators in New Zealand was updated. It was found that a modified form of Penman's equation could be used to calculate average monthly open-water evaporation from meteorological parameters. Four maps showed the variation of annual open-water evaporation as well as the distribution for selected months. There were five stations, all located at very exposed windy sites that had low relative humidity, on the South Island where annual values exceeded 1000 mm. The annual averages were mainly in the range 650-850 mm on the North Island and 700-950 mm on the South Island. A reduction factor of 0.69 was recommended for converting standard galvanized-iron raised-pan tanks, which are identical with U.S. Class A pans, to open water. The factor recommended for the standard New Zealand sunken-pan evaporimeter was 0.86. Evaporation showed a marked seasonal variation, with maxima in December-January and minima in June-July. For two representative stations, the coefficient of variation of monthly evaporation was 12%, about one-fifth that of rainfall. (Roberts-ISWS)
W75-01307

MANAGEMENT OF PHREATOPHYTE AND RIPARIAN VEGETATION FOR MAXIMUM MULTIPLE USE VALUES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-01382

EVAPOTRANSPIRATION OF WHEAT, OATS AND BARLEY,
Ministry of Agriculture, Lethbridge (Alberta). Research Station.
E. H. Hobbs, and K. K. Krogman.
Can J Plant Sci. Vol 54, No 1, p 23-27, 1974. Illus.
Identifiers: Avena-sativa, *Barley, *Evapotranspiration, Grains, Hordeum-vulgare, Irrigation, *Oats, Production, Scheduling, Transpiration, Triticum-aestivum, *Wheat.

Daily and seasonal evapotranspiration (ET) from irrigated plots of wheat (Triticum aestivum L.), oats (Avena stativa L.) and barley (Hordeum vulgare L.) were measured during a 3-yr period. All plots were treated alike but each was irrigated individually when soil tension at a depth of 30 cm reached 400 mbars. Seasonal ET differed among years and was less for barley than for wheat and oats. Daily ET differed slightly among years but not significantly among crops. Oats tended to produce the most grain and, on the basis of grain production, to use water most efficiently. On the basis of stage of maturity, the 3 crops can be considered alike for irrigation scheduling purposes.--Copyright 1974, Biological Abstracts, Inc.
W75-01493

EVAPORATION FROM SNOWDRIFTS UNDER OASIS CONDITIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W75-01532

DIFFERENT SENSITIVITY OF PHOTOSYNTHESIS AND TRANSPIRATION TO SOME HERBICIDES AND TRANSPIRATION INHIBITORS,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen.
For primary bibliographic entry see Field 3F.
W75-01615

VARIABILITY OF RELATIONSHIPS BETWEEN TRANSPIRATION, SHOOT AND ROOT METABOLISM, AND NUTRIENT UPTAKE IN INTAKE PLANTS,
Agricultural Research Council, Wantage (England). Letcombe Lab.
R. S. Russell.
J Exp Bot, Vol 24, No 83, p 1053-1055, 1973.
Identifiers: Intact plants, *Metabolism, *Nutrient uptake(Plants), Roots, Shoots, *Transpiration, Methodology, Absorption.

Reasons are given for rejecting recent criticisms of methods used in earlier work on relationships between transpiration and the transfer of nutrients to the shoots of intact plants.--Copyright 1974, Biological Abstracts, Inc.
W75-01616

2E. Streamflow and Runoff

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF MISSOURI FLOODS,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 4A.
W75-01171

WATER RESOURCES OF WISCONSIN, TREMPEALEAU-BLACK RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W75-01175

RECONNAISSANCE OF THE WATER RESOURCES OF THE ARDMORE AND SHERMAN QUADRANGLES, SOUTHERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W75-01176

DRAINAGE AREAS OF STREAMS IN ARKANSAS, WHITE RIVER BASIN,
Geological Survey, Little Rock, Ark.
J. N. Sullavan.
Open-file report, 1974. 123 p, 2 fig, 1 tab.

Descriptors: *River basins, *Arkansas, *Drainage area, River systems, Watersheds(Basins).
Identifiers: *White River basin(Ark), Drainage basins.

Drainage areas for streams in the White River basin in Arkansas were determined in accordance with procedures recommended by the Subcomittee on Hydrology of the Federal Inter-Agency River Basin Committee. The drainage area of a stream is one of the most significant parameters used in computations for the design of hydraulic structures or in hydrologic investigations. The White River originates in northwest Arkansas and generally flows northward to the Arkansas-Missouri State line. (Knapp-USGS)
W75-01183

FLOOD ESTIMATION IN EASTERN NEW SOUTH WALES - A DESIGN METHOD,
New South Wales Univ., Kensington, (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01256

SIMPLE NONLINEAR MODEL FOR FLOOD ESTIMATION,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01298

FLOOD CONTROL IN RESERVOIRS AND STORAGE POUNDS--A DISCUSSION,
Binnie and Partners, London (England).
For primary bibliographic entry see Field 4A.
W75-01301

SYSTEMATIZATION OF FLOOD CONTROL MEASURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01302

RANGE OF CUMULATIVE SUMS, I. EXACT AND APPROXIMATE EXPECTED VALUES,
Colorado State Univ., Fort Collins.
J. D. Salas-La Cruz.
Journal of Hydrology, Vol 23, No 1-2, p 39-66, 1974. 10 fig, 5 tab, 20 ref. NSF Grant GK-31512X.

Descriptors: *Storage, *Reservoirs, *Streamflow, *Stochastic processes, *Reservoir stages, Hydrology, Analytical techniques, Mathematics, Statistical models, Computers, Simulation analysis, Equations.
Identifiers: *Maximum partial sum, Minimum partial sum, Range.

The storage problem of within-the-year water fluctuations was studied under the assumption of infinite storage. The reservoir storage was given by the range or adjusted range of the partial sum of random variables. Some results concerning the expected value of the range when the partial sums are composed of non-identically distributed normal variables were given. Using the univariate, bivariate, and trivariate normal distribution functions for the marginal and joint distributions of the partial sums, the exact expressions of the expected range were derived. From these general expersions, particular cases of the expected range of independent and linearly dependent variables were indicated. Based on these exact equations of the expected range, the simulation approach was used to obtain approximate equations for higher values of the number of random variables. (Singh-ISWS)
W75-01303

RUN HYDROGRAPHS FROM POISSON GENERATED RUN LENGTHS,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
L. A. V. Hiemstra.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY11, Proceedings Paper 10959, p 1617-1630, November 1974. 7 fig, 4 tab, 12 ref, 2 append.

Descriptors: *Hydrographs, *Flood peak, *Runoff, *Analytical techniques, *Seasonal, Statistical methods, Floods, Hydraulics, Flood frequency, Hydrologic data, Probability, Synthetic hydrology, Flood routing, Flood stages, Floodwater.
Identifiers: *South Africa(Vaal River), Theory of runs, Poisson generating process.

All available river discharge data were used by dividing the year into four seasons, finding means and standard deviations for these seasons, and transforming the flow record by subtracting seasonal mean from the flow and dividing the remainder by the seasonal standard deviation. This allows exploitation of extreme value information masked by the seasonal cycle in streamflow. The 50-year continuous instantaneous hydrograph for the Vaal River at Sanderton was transformed for assessing the occurrence of rare events. The level-crossing theory, also called the theory of runs, helps in sorting different events according to the probability of their reaching selected levels of flood peaks. This theory applied to the 50-year transformed hydrograph led to the postulation of a Poisson generating process for surplus run lengths. Use of the relative frequency of occurrence of surplus run lengths of various magnitudes at selected truncation levels enabled the extraction of composite flood hydrographs with desired run periods. These composite flood hydrographs were designated as run hydrographs. Flood peaks from Gumbel's method and run hydrographs for various recurrence intervals were compared. (Singh-ISWS)
W75-01304

STREAM GRADIENT AS A FUNCTION OF ORDER, MAGNITUDE, AND DISCHARGE,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
J. J. Flint.
Water Resources Research, Vol 10, No 5, p 969-973, October 1974. 2 fig, 1 tab, 14 ref.

Descriptors: *Gradients(Streams), *Profiles, Geomorphology, Channel morphology, Discharge(Water), Hydraulic properties, Streamflow forecasting, Streams, Hydraulics, Fluvial sediments, Equations.
Identifiers: *Hydraulic geometry, *Stream morphology, Link-slope exponent, Stream order relation.

The downstream change in the average channel gradient derived from order data can be expressed in terms of either area or discharge in the form of a power function. Similarly, the average channel profile based on link slope can be related to link magnitude or discharge in the form of a power equation. Finally, from the downstream hydraulic goemetry equation the change in stream gradient can be expressed in terms of discharge or area as a power function. Because these relations are identical in form and in their independent parameters, rates of change in slope obtained by all three approaches should be equivalent. The rates of change in stream gradient derived from the power functions above yield almost identical averages for entire channel networks. The order data give a rate of -0.63, whereas link slope exponents average -0.60. These values are well within the range of variation for published data obtained for the hydraulic geometry equation (averages between-0.49 and 0.95) and may represent a quasi-equilibrium tendency for entire fluvial systems. (Jess-ISWS)
W75-01306

FLOW AND BED TOPOGRAPHY IN CHANNEL BENDS,
Technical Unov. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-01308

RIVER MILEAGE TABULATIONS FOR THE COLORADO RIVER BASIN. COMMUNITIES AND MAJOR TRIBUTARIES.
Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 7C.
W75-01309

AUSTRALIAN REPRESENTATIVE BASINS PROGRAMME--PROGRESS 1973.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 7C.
W75-01310

STREAM GAUGING INFORMATION, AUSTRALIA--SUPPLEMENT 1972.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 7C.
W75-01311

PROGRESS REPORT ON FLOOD-FREQUENCY SYNTHESIS FOR SMALL STREAMS IN ALABAMA,
Geological Survey of Alabama, Montgomery.
J. F. McCain.
Alabama Highway Research HRP Report No 70 (Research Project 930-010), September 1974. 109 p, 4 fig, 3 tab, 12 ref, append.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Flood frequency, *Alabama, Simulation analysis, Frequency analysis, Design flood, Design flow, Small watersheds.

A rainfall-runoff model was used to obtain synthetic flood-frequency curves for 21 small stream-gaging stations in Alabama. The watersheds range in size from 1.28 to 15.9 square

miles. The model contains three components: antecedent moisture, infiltration, and routing, and utilizes 10 parameters in obtaining an optimum duplication of a set of observed flood events. Model parameters and basin characteristics are listed for each site. Some parameters appear to be physically significant but further study of parameter significance is needed. Results of the model calibration phase and simulated flood-frequency curves for each site developed from several long-term rainfall records are included. (Knapp-USGS)
W75-01350

HYDROLOGY OF WARM SNOWPACKS AND THEIR EFFECTS UPON WATER DELIVERY--SOME NEW CONCEPTS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-01530

CONCEPTUAL DESIGN OF A MULTIPURPOSE INSTRUMENT FOR WINTER STREAM METERING,
Canada Center for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 7B.
W75-01587

EXEMPLARY WATER LEVEL AND RUNOFF MEASURING DEVICES IN MOUNTAIN WATER STREAMS (VORBLIDLICHE WASSERSTANDS-UND ABELUSSMESSANLAGEN IN GEBIRGSWESSERN),
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
H. Hinrich.
Die Bautechnik, Vol 51, No 4, p 131-133, April, 1974. 7 fig, 2 ref.

Descriptors: *Runoff, *Measurement, Streams, Rivers, *Gages, Weirs, Basins, Canals, *Water levels.
Identifiers: *Argentina(Conlara Valley), Switzerland, Water level gages.

Two simple water-level and runoff gages installed in the El Rincon and Benetez rivers in the Conlara Valley in Argentina are described and compared with a spohisticated water-level gauge in the Massa river in Switzerland. In the mountain creeks in Argentina, the gauging section is concretted in the bed with a transversal slope of 1:20. Water-level and runoff measurement are done by simple hydrometric vanes fastened to support on the banks. The highly sophisticated and expensive gauging station on the Massa river in Switzerland, composed of artificial weir, stilling basin and measuring canal, is suitable also for the measurement of glacier water on the basis of preliminary model experiments. The simple gauging stations in Argentina are especially suitable for measurement of the dry-weather runoff. (Tackacs-FIRL)
W75-01643

CASE STUDY OF REGIONAL ANALYSIS TECHNIQUES FOR DESIGN FLOOD ESTIMATION,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
G. W. Kite.
Canadian Journal of Earth Sciences, Vol 11, No 6, p 810-808, June, 1974. 2 fig, 3 tab, 12 ref.

Descriptors: *Floods, *Regional analysis, Equations, *Highways, Estimation, *Canada, Model studies, Design criteria, *Design flood, *Culverts.
Identifiers: Mackenzie highway(Canada), Slope-area method.

Regional analysis describes those techniques permitting estimation of parameters for those areas in which measurements of the parameters are not available. Two techniques, index-flood regional analysis and a simplified square grid method, were used to estimate design floods for culverts on the proposed Mackenzie highway. The results of these two techniques were compared with design floods estimated by the rational equation, slope-area method and an envelope of recorded extremes. Regional analysis techniques give design flows at least an order of magnitude less than those of other techniques. (Prague-FIRL)
W75-01648

2F. Groundwater

DERIVATION OF AN EQUATION OF INFILTRATION,
Universite Scientifique et Medicale de Grenoble (France). Institut de Mecanique.
For primary bibliographic entry see Field 2G.
W75-01126

GROUNDWATER - BASEFLOW RELATIONSHIPS AND BASEFLOW PREDICTIONS FROM GROUNDWATER LEVELS ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
T. V. Wilson, and E. H. Wiser.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 2, p 269-274, March-April 1974. 11 fig, 2 tab, 9 ref. OWRT A-023-SC(6).

Descriptors: *Surface-groundwater relationships, *Base flow, *Watersheds(Basins), *Water table, Groundwater, Groundwater basins, Alluvial aquifers, Water table aquifers, Hydrographs, Hydrology, Small watersheds, Soil water movement, *South Carolina, Southeast United States, Seepage.
Identifiers: *Clemson Research Watershed(So Car), Piedmont region.

Climatic and hydrologic data for the prediction of baseflow during five years, 1966 to 1970, were obtained from the Clemson Research Watershed, a 561 acre area in the Piedmont region. The shallow water table level was predicted on the basis of inflow of groundwater from the upper watershed zone combined with direct recharge from precipitation, and outflow occurring as baseflow and evapotranspiration. Surface runoff was separated from baseflow by hydrograph separation techniques. Only water table fluctuation adjacent to the stream directly influenced stream baseflow and was responsive to recharge by excess soil water and to loss by evapotranspiration when the overlying soil profile was in moisture stress. Where flat alluvium flood plains exist along creeks and bedrock does not outcrop into the stream floor, the soil in the alluvium receives a relatively constant rate of flow from the saturated profile of the higher elevations. Variations in the rate of flow were dependent upon the water table gradient variations which varied less than 10 percent annually in the period studied. Outflow from the shallow water table into the stream bed was linear with head at the lower stages, but as the stage increases the prediction equation takes on a quadratic component. The upper watershed zone where the water table ranges in depth below 10 to 12 ft is an area of recharge. The lower watershed zone where the water table ranges from approximately 5 to 12 ft changes between a recharge area and a discharge area several times a year. (Humphreys-ISWS)
W75-01127

SUBSIDENCE IN UNITED STATES DUE TO GROUND-WATER OVERDRAFT--A REVIEW,
Geological Survey, Sacramento, Calif.
J. F. Poland.
In: Proceedings of the Irrigation and Drainage Division Specialty Conference held at Fort Collins, Colorado, April 22-24, 1973: American Society of Civil Engineers, p 11-38, 1973. 15 fig, 31 ref.

Descriptors: *Subsidence, *Withdrawal, *Groundwater, *Reviews, *Hydrogeology, Louisiana, Texas, Arizona, Nevada, California, Land subsidence, Compaction.
Identifiers: Groundwater overdraft.

In many areas of the U.S., overpumping has drawn down water levels 100 ft to as much as 600 ft. Where these declines have occurred in unconsolidated aquifer systems containing many fine-grained compressible interbeds, the increase in effective stress has caused extensive land-surface subsidence. Significant subsidence due to water-level decline occurs in five States: Louisiana, Texas, Arizona, Nevada, and California. Principal problems caused by the subsidence are (1) changes of elevation and gradient of natural drainages and water-transport structures, (2) failure of water wells from compressive rupture of casings, due to the compaction, and (3) tidal encroachment in lowland coastal areas. Large imports of surface water to several subsiding areas in California have greatly reduced groundwater pumpage, resulting in dramatic recoveries of artesian head that have slowed or nearly stopped the subsidence. (Knapp-USGS)
W75-01159

VALLEY FILL IN THE ROSWELL-ARTESIA AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
F. P. Lyford.
Open-file report, September 1973. 26 p, 14 fig, 5 ref.

Descriptors: *Aquifers, *New Mexico, *Alluvium, Hydrogeology, Karst hydrology, Carbonate rocks, Gypsum, Water levels, Withdrawal.
Identifiers: *Roswell(NM), *Artesia(NM), *Valley-fill aquifers.

The Roswell-Artesia valley-fill aquifer was studied using drill samples from 225 water and oil wells in an area 70 miles long and 20 miles wide in southeastern New Mexico. Maps showing thickness of the aquifer and its saturated thickness were constructed. Maximum depth of valley fill is about 300 feet in large closed depressions near Roswell, Hagerman, and Artesia. The depressions were formed by the solution of carbonates and evaporites that underlie the fill. Maximum saturated thickness is about 250 feet in depressions near Hagerman and Artesia and about 300 feet in a depression near Roswell. (Knapp-USGS)
W75-01162

WATER RESOURCES OF THE MILFORD AREA, UTAH, WITH EMPHASIS ON GROUND WATER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-01168

GROUND-WATER RESOURCES OF THE LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-01169

GROUND-WATER HYDROLOGY OF THE HOLLISTER AND SAN JUAN VALLEYS, SAN BENITO COUNTY, CALIFORNIA, 1913-68,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01173

GROUND WATER IN HASKELL COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.

W75-01174

WATER RESOURCES OF WISCONSIN, TREMPEALEAU-BLACK RIVER BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W75-01175

RECONNAISSANCE OF THE WATER RESOURCES OF THE ARDMORE AND SHERMAN QUADRANGLES, SOUTHERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W75-01176

WATER-TABLE DECLINE IN THE ALLUVIAL AQUIFER, SPRING 1964 TO SPRING 1974, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Pueblo, Colo.
For primary bibliographic entry see Field 7C.
W75-01177

STRUCTURE AND STRATIGRAPHY IN THE VICINITY OF THE SHELL OIL CO. SANTA FE PACIFIC NO. 1 TEST WELL, SOUTHERN SANDOVAL COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W75-01179

GROUND WATER IN THE SOUTHWESTERN PART OF THE JEMEZ MOUNTAINS VOLCANIC REGION, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
F. W. Trainer.
New Mexico Geological Society Guidebook, 25th Field Conference, Ghost Ranch (Central-Northern New Mexico), p 337-345, 1974. 2 fig, 2 tab, 24 ref.

Descriptors: *Groundwater, *Hydrogeology, *Springs, *Hot springs, *New Mexico, Thermal water, Surface-groundwater relationships, Base flow.
Identifiers: *Jemez Mountains(NM).

The Jemez Mountains of New Mexico are relatively well watered, as compared with the surrounding lower country. Part of the water from rain and melting snow runs off quickly, but part drains more slowly, being stored temporarily in the ground and even circulating to some depth before reappearing at the land surface. The water supports a vegetative cover, including dense forest in the high country, provides the base flow of the streams, and is the source of water supply in the region. Warm springs in the Jemez Mountains volcanic region have long been used for bathing, and their water has been thought by many to have therapeutic value. More recently the springs have taken on added significance as evidence of the geothermal resources of the region. These warm springs are few in number and their total flow is much less than that of the nonthermal springs. The base runoff consists of water provided by (1) groundwater runoff from near-surface deposits, (2) flow from warm springs that drain deeper aquifers within the young volcanoes in the ring-fracture zone, (3) discharge from perched aquifers that form groundwater mounds in volcanic and sedimentary rocks in interstream plateaus, and (4) flow of mineralized groundwater, from depth, through seeps in the floor of San Diego Canyon inside the caldera. (Knapp-USGS)
W75-01180

WATER AND AIR MOVEMENT IN BOUNDED LAYERED SOIL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Sonu.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 438, $6.25 in paper copy, $2.25 in microfiche. Ph D Dissertation, April 1973. 152 p, 68 fig, 38 ref, append. OWRT B-070-COLO(9).

Descriptors: *Groundwater, *Groundwater recharge, *Unsaturated flow, *Capillary action, *Mathematical studies, *Computer models, Stratified flow, Natural recharge, Unsteady flow, Percolation, Infiltration, Moisture availability, Zone of saturation, Mathematics, Equations, Pressure, Hysteresis, Numerical analysis, *Simulation analysis.
Identifiers: *Layered soils, Multiphase flow, Entrapped air.

The movement of two fluids in the bounded layered porous medium was treated analytically and computer simulations were conducted for various boundary conditions and initial saturation profiles. The first portion of the analyses was devoted to investigating the validity of the analytic solution by comparing the infiltration rate from the experimental results and the computer simulations. Excellent agreement for the infiltration rate was found for the homogeneous medium of various depths in the early stage of the infiltration process and at large times. The deviation between experimental result and computer simulation was believed to be due to the change in medium characteristics caused by compressed air in the pores of the medium. Theories for the various boundary conditions and initial saturation profiles were developed to simulate various field conditions such as constant ponding, rainfall, fluctuating water table, bounded or infinite medium and uniform or nonuniform inital saturation profile. The movement of a given saturation across the interface between the different soil layers was theoretically developed by considering the conservation of mass. It was shown that the existence of the interface affects the infiltration rate when the average total velocity was greater than zero. The transition from one layer to another layer caused a change in the capillary drive and consequently influenced the infiltration rate. No apparent change in the infiltration rate was observed as the wetting front crossed the interface when the average total velocity equaled zero. (Prickett-ISWS)
W75-01204

THEORY OF SOME FREE SURFACE GROUNDWATER SEEPAGE PROBLEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
M. Y. Khan.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 443, $6.25 in paper copy, $2.25 in microfiche. Ph D Dissertation, 1973. 163 p, 16 fig, 9 tab, 74 ref, 5 append. OWRT B-019-IA(4).

Descriptors: *Groundwater, *Ditches, *Flow nets, *Mathematical models, *Equations, Irrigation engineering, Water conveyance, Seepage, Percolation, Groundwater movement, Computer models, Numerical analysis, Flow, Porous media, Unconfined water.
Identifiers: *Parallel ditches, *Groundwater mounds, Three-dimensional flow, Potential functions, Stream functions.

Analytical methods were developed for steady-state unconfined flow to determine the exact location of the free surface in (1) a two-dimensional flow of groundwater between two parallel ditches, (2) a two-dimensional flow in a groundwater mound formed by water infiltrating from a rectangular recharge basin, and (3) a three-dimensional axisymetric flow in a mound formed by infiltration from a circular recharge basin. Flow in a saturated region below the watertable was considered capillary but effects were neglected. It was shown how the analysis of a two-dimensional flow could be carried over todetermine the location of the free surface in a three-dimensional axisymmetric flow toward a well. Solutions were obtained from potential theory by solving Laplace's equation, and to satisfy an appropriate set of boundary conditions a modified Gram-Schmidt technique and a simple iterative scheme were used. Solutions were given in the form of potential functions and stream functions. These functions were used to determine the exact location of the free surface and to draw flow nets. Computer programs were also developed to determine the location of the free surface and to draw flow nets. The exact free surface heights computed from the potential theory were compared with the approximate heights computed from Dupuit-Forchheimer (D.F.) theory. For flow between two parallel ditches, D.F. theory yielded satisfactory results for moderate drawdowns. For excessive drawdowns, D.F. theory underestimated the free surface significantly. For an unconfined flow in two- and three-dimensional mounds, D.F. theory was found to underestimate the maximum height of the free surface. (Prickett-ISWS)
W75-01205

SOME APPLICATIONS OF STATISTICAL METHODS TO GROUND-WATER FLOW SYSTEM ANALYSIS,
Nevada Univ., Reno. Center for Water Resources Research.
R. L. Cooley, J. W. Fordham, and J. A. Westphal.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 457, $4.25 in paper copy, $2.25 in microfiche. Technical Report Series H-W, No 14, April 1973. 53 p, 7 fig, 1 plate, 6 tab, 39 ref, 2 append. OWRT A-045-NEV(2).

Descriptors: *Statistical methods, *Groundwater movement, Water level fluctuations, Nevada, Urbanization, Withdrawal, Water balance, Seasonal, Evapotranspiration, Recharge, Hydrogeology, Computer programs.

Statistical methods were developed for use with deterministic procedures in analyzing and predicting groundwater responses to variations in hydrologic and geologic conditions. An inverse method computes the transmissivity and source-sink distribution in shallow sediments, based on least squares fits of analytic solutions to field data for steady-state flow along streamlines. Constant or linearly varying parameters can be derived with the method. The inverse method can be used to define or refine zones of constant magnitude or linearly varying aquifer parameters. The method was tested at Truckee Meadows, Nevada. Hydrologic data subjected to statistical analyses include: streamflow records; canal diversion; water-level records in wells; records of sewage treatment plant returns; temperature records; and pan evaporation records. Predictor variables having mainly seasonal variability were most significantly associated with water-level fluctuations in majority of wells. The majority of wells had a lag time of response of about two months behind the predictor variables. The strongly seasonal control of water-level fluctuations was further demonstrated by multiple regression analyses. Water levels could be projected forward or backward for over 20 years using multiple regression equations with diversions, temperature, and pan evaporation as the predictor variables. Urbanization has, thus far, had little effect on the water-table position. (Knapp-USGS)
W75-01211

THEORETICAL DISCUSSION OF GROUNDWATER FLOW TOWARDS A SINK,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
J. S. Colville.
Technical Paper, CSIRO Division of Soils, No. 22, 1974. 18 p, 9 fig, 1 append.

Descriptors: *Groundwater movement, *Mathematical models, *Natural recharge, *Sinks,

*Vegetation effects, Aquifers, Equations, Forests, Potentiometric level, Water level fluctuations, Surface-groundwater relationships.
Identifiers: *Boussinesq's equation.

An idealized form of an actual field problem involving the flow of groundwater towards a sink region is studied mathematically. The original field problem was to decide whether the aquifer is recharged uniformly or if there is no recharge within a forested region extending up to about 10 km from the sink. Attention is first given to the shape of the water table and then to its oscillations produced by a periodic annual recharge. The solutions of Boussinesq's equation are discussed with special emphasis on the numerical stability of the solution. A brief account of the features of the solution is then given and some extensions are discussed. (CSIRO)
W75-01241

AN EXAMPLE OF THE USE OF BACTERIOPHAGE AS A GROUNDWATER TRACER,
Halcrow (William) and Partners, London (England).
R. Martin, and A. Thomas.
Journal of Hydrology, Vol 23, No 1-2, p 73-78, 1974. 2 fig, 2 tab.

Descriptors: *Tracers, *Bacteriophage, *Seepage, Animal parasites, Bacteria, Slope stability, Flow, Groundwater movement, Saturated flow, Groundwater recharge, Piezometers, Velocity, Faults(Geologic), Hydrogeology.
Identifiers: *Aerobacter aerogenose 243 type 2 phage, *United Kingdom(Ely Valley Wales).

A recent experiment at the site of Coedely Spoil Heap (National Coal Board Tip. No. 214) in Glamorganshire, Wales, indicated that the injection of bacteriophage grown under laboratory conditions has a potentially useful role to play in future studies of groundwater movement. In the experiment, the movement of shallow groundwater beneath the tip was traced over distances of up to 680 m, confirming deductions that had been made previously from a study of the hydrogeological characteristics of the site. As a tracer, bacteriophage do not seem to suffer absorption in certain media as experienced with various other tracers, particularly organic dyes. (Visocky-ISWS)
W75-01291

PARTIALLY PENETRATING MULTIPLE-WELL SYSTEM IN A CONFINED AQUIFER WITH APPLICATION TO A RELIEF WELL DESIGN,
Indian Inst. of Tech. Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W75-01295

DETERMINATION OF GROUNDWATER RECHARGE WITH TRITIUM,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2G.
W75-01299

DATA FOR SELECTED WATER WELLS, YOUNTVILLE QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01366

DATA FOR SELECTED WATER WELLS, NAPA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01367

DATA FOR SELECTED WATER WELLS, CALISTOGA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01368

DATA FOR SELECTED WATER WELLS, RUTHERFORD QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01369

DATA FOR SELECTED WATER WELLS, ST. HELENA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01370

TWO DIMENSIONAL STOCHASTIC MODEL OF A HETEROGENEOUS GEOLOGIC SYSTEM,
California Univ., Berkeley. Dept. of Civil Engineering.
M. J. Lippman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 682, $5.75 in paper copy, $2.25 in microfiche. Ph.D. Dissertation, 1973. 135 p, 24 fig, 22 tab, 53 ref, (California Water Resources Center Project UCAL-WRC-W-189). OWRR B-066-CAL(3).

Descriptors: *Stochastic processes, *Markov processes, Mathematical models, Model studies, *California, Computer programs, Poisson ratio, *Basins, *Finite element analysis, Groundwater.
Identifiers: *Livermore Valley(Calif), *Poisson line model.

Models based on probabilistic laws are increasingly being employed to simulate heterogeneous geologic systems. One such model, the 'Poisson lines' model, is discussed. This is a two dimensional stochastic model with Markovian properties which is generated by a planar Poisson point process. The probabilistic and geometric properties of the model are reviewed, and its features are compared to those of geologic basins. Based on the model, a procedure is given which, under assumptions of statistical homogeneity and presence of Markovian properties could be used to simulate discontinuous layering shown by heterogeneous geologic systems. A computer program has been developed for this purpose. The application of the model is illustrated by simulating a cross-section of the Mocho Subbasin of the Livermore Valley, California. A finite element techinque is used to evaluate the steady state ground water flow through the simulated cross-section. An analysis is made of the effect of different finite element meshes on the accuracy of the calculated flow rates and on the description of the complex model geometry. (Snyder-California, Davis)
W75-01399

WATER RESOURCES MANAGEMENT IN COASTAL PLAIN AQUIFERS,
Wisconsin Univ., Oshkosh.
For primary bibliographic entry see Field 4B.
W75-01459

APPLICATION OF GROUNDWATER MEASUREMENTS BY MEANS OF RADIOISOTOPES ON GROUNDWATER EXPLORATION,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 4B.
W75-01463

2G. Water In Soils

DERIVATION OF AN EQUATION OF INFILTRATION,
Universite Scientifique et Medicale de Grenoble (France). Institut de Mecanique.
H. J. Morel-Seytoux, and J. Khanji.
Water Resources Research, Vol 10, No 4, p 795-800, August 1974. 3 fig, 1 tab, 15 ref. OWRT B-070-COLO(12). 14-31-0001-3566.

Descriptors: *Infiltration rates, *Unsaturated flow, *Capillary conductivity, *Permeability, Percolation, Hydraulic conductivity.
Identifiers: Finite difference method.

A precise physical meaning was shown for the emperical parameters developed by Green and Ampt (1911). The functional relation between the effective capillary head and the initial water content was obtained. In addition, it was shown that Green and Ampt's assumption of a front separating a saturated zone from the zone at the initial water content can lead to errors of prediction of 10-70 percent. The formulas developed are both simple and accurate and of practical value to the hydrologist. (Gibb-ISWS)
W75-01126

MINERAL AND CHEMICAL COMPOSITION OF FINE-DISPERSED FRACTIONS OF THE DESERTED ANCIENT IRRIGATION SOILS IN MURGAB OASIS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. P. Aranbaev, A. Gaipova, M. M. Niyazova, and N. Dadyeva.
Probl Osvoeniya Pustyn. 1. p 34-45, 1973, Illus, English summary.

Descriptors: *Soil properties, *Clay minerals, Soil chemistry, Arid lands, Irrigable lands.
Identifiers: Murgab Oasis.

The mineralogical and chemical composition of clay fractions of the soils is characterized by homogeneity. The latter is caused by the homogeneous composition of clay minerals and the prevalence of hydromica. In changing from takyrs and takyr-like soils, considerable enrichment of soils with K2O, A12O3, biogenic products of soils, considerable enrichment of soils with K2O, A12O3, biogenic products of soil formation (SO3, humus) and a deficiency of MgO and CaO are observed. The clay fraction formation is a stable stage of transformation of the material composition of fine-dispersed stage of formerly irrigated desert soils of the arid zone.--Copyright 1974, Biological Abstracts, Inc.
W75-01154

WATER AND AIR MOVEMENT IN BOUNDED LAYERED SOIL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-01204

FOR A MODIFIED THEORY OF INFILTRATION. 2ND PART HOW, (POUR UNE THEORIE MODIFIEE DE L' INFILTRATION. 2 EME PARTIE: COMMENT),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Cah. O.R.S.T.O.M., ser. Hydrol., Vol X, No 3, 1973, p 199-209. 6 fig, 1 tab, 17 ref. OWRT B-070-COLO(11). 14-31-0001-3566.

Descriptors: *Infiltration, Flow, Air pollution effects.
Identifiers: Subsurface hydrology, *Two-phase flows.

The problem of infiltration is treated as a two-phase flow problem. A problem of imbibition without air compression effects is used to show that the two-phase solution is computationally simpler than the usual solution. It is also shown on a problem of infiltration, again without compression effects, that the customary solution fails to account properly for the phenomenon of viscous interaction between two moving fluids. On either ground of better modeling of the physical phenomena or of greater computational efficiency, the two-phase formulation is superior to the traditional one.
W75-01220

SUBSURFACE DRAINAGE SOLUTIONS BY GALERKIN'S METHOD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
P. Dass, and H. J. Morel-Seytoux.
Proceeding of ASCE, Journal of the Irrigation and Drainage Division, Vol 100, No IR1, Proc Paper 10397, March 1974. p 1-15, 8 fig, 1 tab, 15 ref. OWRT B-076-COLO(3). 14-31-0001-3866.

Descriptors: *Aquifers, Water table, *Drainage, *Subsurface drainage, Methodology, *Design criteria.
Identifiers: *Galerkin's method, Boussinesq's equation.

For the solution of drainage problems a linearized form of Boussinesq's equation is often used. To improve the design, higher order approximations have been used. A variation of Galerkin's method is used to solve the nonlinear Boussinesq equation. By comparison it is found that the linearized method, when the drawdown to aquifer depth ratio, H/d, becomes large, provides too optimistic designs. The design criteria based on the linearized Boussinesq equation overestimates the rate of drainage for two reasons: (1) They do not account for important nonlinear effects; and (2) they do not account for the delaying effect of the unsaturated flow condition above the water table. The use of Galerkin's method makes it possible to account for the nonlinear effect which is quite significant.
W75-01221

AIR ENTRAPMENT AS A POSSIBLE SOURCE OF ERROR IN THE USE OF A CYLINDRICAL HEAT PROBE,
Oregon State Univ., Corvallis.
N. K. Nagpal, and L. Boersma.
Soil Science Society of America Proceedings, Vol 37, No 6, November-December 1973, p 828-832. 4 fig, 3 tab, 12 ref. OWRT B-001-ORE(12).

Descriptors: Thermal properties, *Soil investigations, *Moisture content, *Thermal conductivity, Soil water, *Porous media, Particle size, Measurement.
Identifiers: *Heat probes, Errors, Air entrapment.

The cylindrical heat probe is frequently used to measure the thermal conductivity of soils. Its theory is based on the assumption of zero thermal contact resistance at the probe surface. Noncompliance with this assumption could result from air entrapment at the probe surface, at the time of inserting the probe into the porous material. Results are reported which show that the use of the heat probe can yield erroneous results which can be explained on the basis of air entrapment at the probe surface. Additional experiments were carried out to seek information regarding the relationship between thermal conductivity and soil water content for materials made up of different particle sizes. The porous media used consisted of three glass bead size fractions with diameters of 53-74, 74-105, and 149-210 micro m obtained by dry sieving. Results of the experiments indicated that at the ambient temperature of 26C the relationship between thermal conductivity and water content was the same for the three size fractions. Experiments were not conducted at other ambient temperatures.
W75-01232

THE SELF-DIFFUSION COEFFICIENTS OF 45CA AND 2,4-DICHLOROPHENOXYACETIC ACID,
Oregon State Univ., Corvallis.
S. K. Saxena, L. Boersma, F. T. Lindstrom, and J. L. Young.
Soil Science, Vol 117, No 1, 1974, p 14-20. 3 fig, 1 tab, 20 ref. OWRT B-001-ORE(13).

Descriptors: Diffusion, *Soil investigations, Measurement, Organic acids, *Porous media, Density, Methodology, *Calcium chloride.
Identifiers: *Agar method, *Cell diffusion method, *Diffusion coefficient, *Acetic acid, Calcium-45.

The agar method and the cell diffusion method were used to measure the self-diffusion coefficients of 45Ca in CaCl2 solution and 14C-labelled 2,4-dichlorophenoxyacetic acid. Both methods gave results that were in agreement with theoretical considerations. Problems were experienced with the agar method. Difficulties encountered were preparation of stable media of low agar concentration and inability to properly account for physical properties of the matrix through which diffusion occurred, such as tortuosity, adsorption by the agar, and density gradients with associated viscosity gradients in the agar. The cell diffusion method was simple to use and gave results that were in agreement with values calculated from ionic mobilities. The diffusivities measured with the cell diffusion method were: for 45Ca in CaCl2 solution, K = 0.70 sq cm/day and for 14C-labelled 2,4-D, K = 0.69 sq cm/day.
W75-01233

EFFECT OF PORE SIZE ON DIFFUSION COEFFICIENTS IN POROUS MEDIA,
Oregon State Univ., Corvallis.
S. K. Saxena, L. Boersma, F. T. Lindstrom, and J. L. Young.
Soil Science, Vol 117, No 2, 1974, p 80-86. 3 fig, 2 tab, 22 ref. OWRT B-001-ORE(14).

Descriptors: Diffusion, *Porous media, *Soil investigations, Organic acids, Pores, *Diffusivity, Porosity, Measurement.
Identifiers: *Pore size, *Diffusion coefficient, *Acetic acid.

The effect of pore size on the diffusion coefficient of 2,4-dichlorophenoxyacetic acid was measured. Porous media were made up of glass beads, separated into different size fractions by sieving to obtain desired pore sizes. The results suggest that for small pores as in closely packed particle matrices of less than fine silt size, the rate of diffusion is significantly reduced. The observed diffusion hindrance effect was attributed to a viscous drag caused by the proximity of the pore wall. The phenomenon appears to be in agreement with literature reports. Similar observations with small pores in thin membranes have indicated that the structure of water in small pores is more orderly than that in free solutions. The results suggest that a porous medium diffusion coefficient can be obtained from the free solution diffusion coefficient, but the relation needs to be evaluated for a range of ions and molecules before generalizations can be inferred.
W75-01234

METHODS FOR ANALYSIS OF IRRIGATED SOILS.
Commonwealth Agricultural Bureaux Slough (England); and Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
Technical Communication No 54 of the Commonwealth Bureau of Soils, England, 1974. 208 p.

Descriptors: *Analytical techniques, *Soil chemical properties, *Soil physical properties, *Soil analysis, Electrical conductance, Hydraulic conductivity, Hydrogen ion concentration, Cations, Chlorides, Carbonates, Gypsum, Particle size, Porosity, Soil density, Soil moisture, Expansive soils, Statistical methods, Laboratory tests, Sampling, Soil aggregates.

A practical manual is presented of methods for measuring soil properties relevant to consideration of likely interactions between soils, applied water, crops and management practices in irrigated farming, other than the determination of nutrient elements and the field description of soil profiles. For each determination, the necessary reagents and equipment are listed, followed by procedural steps. Discussions of definitions and units, and details of special equipment are given in six appendices. Methods are given for soil sampling and sample preparation, bulk density, water retention and the moisture characteristic volume change, pore-space and aeration, aggregate stability, hydraulic conductivity, particle-size analyses, pH, conductivity and chloride content, exchangeable cations and cation exchange capacity, carbonate determination, and gypsum determination. There are also chapters on the choice and sequence of determinations and statistical properties of the procedures. (CSIRO)
W75-01239

ON SOLVING THE UNSATURATED FLOW EQUATION: 3. NEW QUASI-ANALYTICAL TECHNIQUE,
Commonwealth Scientific and Industrial Research Organization, Canberra; and Australian National University, Canberra.
J. R. Philip, and J. H. Knight.
Soil Science, Vol 117, No 1, p 1-13. 5 fig, 11 ref, 1974.

Descriptors: *Mathematical studies, *Analytical techniques, *Unsaturated flow, *Equations, *Infiltration, *Soil water movement, Porous media, Sorption, Diffusivity, Flow.
Identifiers: *Parlange's Method.

A new quasi-analytical technique for solving the flow equation is presented, offering the advantages over Parlange's method of freedom to choose an initial assumed flux-concentration relation, thus improving the possible accuracy of the first approximation and allowing higher approximations to preserve integral continuity and thus behave more stably. The technique is studied analytically and numerically for one-dimensional sorption subject to constant concentration conditions, and found to be convergent for a wide range of shapes of the diffusivity function. The general iterative scheme for one-dimensional infiltration subject to constant concentration conditions is presented. Three choices of initial flux-concentration relation give useful first approximations for the lower, upper and close upper bounds of the infiltration rate function respectively. General iterative schemes are also given for two- and three-dimensional sorption subject to constant concentration conditions. (See also W74-04492) (CSIRO)
W75-01240

EFFECTS OF EFFLUENTS OF THE ASTRAKHAN PULP AND BOARD MILL ON SOIL PROPERTIES (VLIYANIE STOCHNYKH VOD ASTRAKHANS-KOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOISTVA POCHV),
For primary bibliographic entry see Field 5B.
W75-01257

SPATIAL VARIABILITY OF FIELD-MEASURED SOIL-WATER PROPERTIES,
California Univ., Davis. Dept. of Water Science and Engineering.
D. R. Nielsen, J. W. Biggar, and K. T. Erh.

Hilgardia, Vol 42, No 7, p 215-259, November 1973. 25 fig, 14 tab, 37 ref.

Descriptors: *Soil water movement, *Hydraulic conductivity, *Bulk density, *Diffusivity, *Infiltration rates, *Diffusion, *Saturation, Retention, Heterogeneity, Particle size, Nitrogen, California, Tensiometers, Chemical analysis, Hydrometers, Leaching, Evapotranspiration, Ponding, Evaporation, Soil physical properties, Laboratory tests, Computer programs, Gamma rays, Attenuation.
Identifiers: Panoche soil series, Neutron moderation.

Infiltration and redistribution of water following an irrigation was studied, and the work was replicated at 20 locations on a 150-hectare plot of land. Hydraulic conductivity was measured as a function of soil-water content at 30.5 cm depth intervals to a depth of 182.9 in twenty 6.5-meter-square plots randomly established over a 150-hectare field. Tensiometers installed at 30.5, 61.0, 91.4, 121.9, 152.4, and 182.9 cm were used to measure hydraulic gradients. Soil-water contents were ascertained from soil-water characteristics obtained from six soil cores taken from each of the above depths for each plot. Variations in soil-water content were found to be normally distributed with depth and with horizontal distance throughout the field, while values of the hydraulic conductivity were found to be log-normally distributed. The correlation between hydraulic conductivity during steady-state infiltration and the clay fraction was significant at the 1% level. Several equations for predicting water movement and retention under field conditions were examined. (Schicht-ISWS)
W75-01292

DETERMINATION OF GROUNDWATER RECHARGE WITH TRITIUM,
National Physical Research Lab., Pretoria (South Africa).
J. C. Vogel, L. Thilo, and M. Van Dijken.
Journal of Hydrology, Vol 23, No 1-2, p 131-140, 1974. 3 fig, 3 tab, 19 ref.

Descriptors: *Tritium, *Radioisotopes, *Radioactive dating, *Groundwater recharge, *Tracers, Infiltration, Soil profiles, Soil water movement, Zone of saturation, Unsaturated flow, Atmosphere, Nuclear explosions, Precipitation(Atmospheric), Hydrogen, Age, Soil moisture, Field capacity, Groundwater movement, Aquifers, Rainfall.
Identifiers: *South Africa(Pretoria).

As a result of nuclear weapon tests, the tritium content of precipitation in South Africa increased to about 20 Tritium Units in 1958 and to above 50 T.U. in 1963. These two distinct rises in the tritium concentration provide a means fo determining the average rate at which moisture percolates through the soil to recharge the groundwater reservoir. Taking radioactive decay into account, water with a tritium content of less than 7 T.U. must date from before 1958, values between 7 and 12 T.U. must be ascribed to rainfall in the years 1958-1962 and values of about 30 T.U. to rainfall since 1963. Examples demonstrated that this record is preserved in soil profiles and were used to calculate groundwater recharge quantitatively. (Visocky-ISWS)
W75-01299

METAL COMPLEXES OF COMPONENTS OF YELLOW ORGANIC ACIDS IN WATER,
New Hampshire Univ., Durham. Water Resource Research Center.
For primary bibliographic entry see Field 5A.
W75-01331

MEASUREMENT OF SOIL MOISTURE BY USE OF THE LATENT HEAT OF VAPORIZATION,
Utah Water Research Lab., Logan.
D. G. Chadwick.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 496, $4.25 in paper copy, $2.25 in microfiche. Report PRJEW015-1, July 1974. 44 p, 11 fig, 3 tab, 5 ref, append. OWRT A-021-UTAH(1). 14-31-0001-4045.

Descriptors: *Soil moisture, *Measurement, *Latent heat, Soil temperature, Soil water, Moisture content, Heat flow.
Identifiers: *Heat of vaporization.

Soil moisture can be determined by utilization of the heat of vaporization principle. Since 540 calories of heat are required to convert 1 gram of liquid water to the vapor phase, considerable 'leverage' is obtained in detecting the amount of water in the soil by heating the soil just higher than the boiling point. The time required for a soil heater to raise the soil temperature past the boiling point is proportional to the water content of the soil. If the input heat rates are held constant and some care is used in test procedures, accurate results can be obtained. The time required to heat small soil samples is approximately 1 minute.
W75-01334

THE CHEMISTRY AND TRANSPORT OF LEAD AND CADMIUM IN SOILS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W75-01335

USE OF PHOSPHORIC AND SULFURIC ACIDS TO REDUCE SOIL CRUSTING AND IMPROVE EMERGENCE OF SUGARBEET (BETA VULGARIS L.) SEEDLINGS,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 3F.
W75-01386

EFFECT OF MIXED-GRASS AND NATIVE-SOIL FILTER ON URBAN RUNOFF QUALITY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5F.
W75-01395

APPLICATION OF THE ENERGY BUDGET FOR PREDICTING SNOWMELT RUNOFF,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 2C.
W75-01533

THERMO-OSMOTIC SOIL MOISTURE TRANSFER UPON FREEZING,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W75-01534

ELECTRICAL PARAMETERS OF SOME FROST-PRONE SOILS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W75-01595

2H. Lakes

THERMAL STRATIFICATION BY RADIATION IN SURFACE LAYERS OF STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
D. M. Snider, and R. Viskanta.
AIAA (American Instite of Aeronautics and Astronautics) Paper No. 74-737, ASME (American Society of Mechanical Engineers) Paper No. 74-HT-44. 1974, 9 p, 8 fig, 18 ref. Presented at AIAA/ASME 1974 Thermophysics and Heat Transfer Conference, Boston, July 15-17, 1974. OWRT A-029-IND(7).

Descriptors: *Thermal stratification, *Radiation, *Temperature, *Energy dissipation, Thermal properties, Cooling, Energy transfer, Convection, Diffusion, Dispersion, Solar radiation, Energy equation.
Identifiers: *Interferograms, Radiant energy.

Analysis is developed for the time dependent thermal stratification in surface layers of stagnant water by solar radiation. The transient temperature distribution is obtained by solving the one-dimensional energy equation for combined conduction and radiation energy transfer using a finite difference method. Experimentally, solar heating of water is simulated using tungsten filament lamps in parabolic reflectors of known spectral characteristics. The transient temperature distribution resulting from radiant heating of pure water in a glass-walled test cell is measured with a Mach-Zehnder interferometer. Measured and predicted temperrature profiles show good agreement, thus verifying the radiation and total energy transfer models in stagnant water. The boundary condition at the air-water interface and internal radiant heating rate must be correctly specified in order to properly model stratification of water by radiation. Interferograms recorded during cooling by convection, evaporation and radiation from the free surface of thermally stratified layer of water clearly illustrate the establishment of free-convection layer of relatively uniform temperature about 1 mm below the air-water interface.
W75-01101

PRELIMINARY STUDIES ON THE PRIMARY PRODUCTION AND ITS RELATION TO FISHERIES OF THE PULICAT LAKE,
Central Inland Fisheries Research Inst., Madras (India).
For primary bibliographic entry see Field 5C.
W75-01105

A MODEL OF THE MYSIDAE PRODUCTION PROCESS, ON THE PATTERN OF PARAMYSIS INTERMEDIA (CZERN) IN THE TSIMLYANSK RESERVOIR (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Volgograd (USSR).
M. P. Miroshnichenko, and F. I. Vovk.
Gidrobiol Zh. Vol 9, No 6, p 36-44. 1973. Illus. English summary.
Identifiers: Biomass, *Model studies, *Mysidae, *Paramysis-intermedia, Production, Reservoirs, Russian-SFSR, *USSR(Tsimlyansk reservoir).

The principal approach to the analysis of the Mysidae population structure of the Tsimlyansk Reservoir, Russian SFSR, USSR is given. All production parameters and production/biomass coefficients, as well as data of a biological nature that cannot be obtained directly from a water body, were calculated by means of a dynamic model of the population structure. This model allows the evaluation of the essential regularities in the population structure dynamics and quantitative connections within it. The proposed model is considered useful in forecasting the further development of the population in number and biomass.--Copyright 1974, Biological Abstracts, Inc.
W75-01121

EFFECTS OF A POWER PLANT ON ZOOPLANKTON DISTRIBUTION AND ABUNDANCE NEAR PLANT'S EFFLUENT,
Wisconsin Univ., Madison. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-01123

QUALITY OF LOCAL LAKES AND STREAMS IN THE LAKE WASHINGTON AND GREEN RIVER DRAINAGE BASINS,
Municipality of Metropolitan Seattle, Wash.
For primary bibliographic entry see Field 5B.
W75-01140

DIEL VARIATION IN OXYGEN PRODUCTION AND UPTAKE IN A MICROBENTHIC LITTORAL COMMUNITY OF A NUTRIENT-POOR LAKE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5C.
W75-01143

KINETICS OF SELF-PURIFICATION OF RESERVOIRS CONTAINING STRONTIUM-90 AS A RESULT OF RADIONUCLIDE ABSORPTION BY BOTTOM SEDIMENTS, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W75-01152

NATURE OF ORGANIC DERIVATIVES OF SELECTED TOXIC METALS IN NATURAL WATERS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W75-01201

AN ANALYTICAL AND EXPERIMENTAL STUDY OF COMBINED CONDUCTION-RADIATION ENERGY TRANSFER IN STAGNANT WATER,
Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
D. M. Snider, and R. Viskanta.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 445, $3.75 in paper copy, $2.25 in microfiche. November 1973. 34 p, 9 fig, 14 ref. OWRT A-029-IND(5).

Descriptors: *Thermal stratification, *Radiation, *Interferometry, *Thermal radiation, *Reservoirs, *Hydraulic models, *Mathematical models, Lakes, Laplaces equation, Laboratory tests, Conduction, Heat transfer, Air-water interfaces, Solar radiation,Temperature, Water temperature, Evaporation, Convection, Energy equation, Energy budget, Energy dissipation.

The transient heating by radiation of a stagnant layer of water was studied both analytically and experimentally. Solar radiation (isolation) was simulated by tungsten filament lamps in parabolic reflectors of known spectral characteristics. The volumetric rate of internal absorption of radiation was predicted by considering spectral absorption, scattering, and multiple forward scattering by the water according to the model of Viskanta and Toor. The transient temperature distribution was predicted by solving the one-dimensional energy equation analytically in closed form after first linearizing the boundary condition at the air-water interface. The analytical model was verified on the basis of laboratory experimental data obtained from transient temperature measurements made in pure water contained in a glass-wall test cell using a Mach-Zehnder interferometer. Comparison of experimental data with the predicted temperature distributions showed good agreement, thus verifying the radiation and total energy models. It was determined that the surface boundary condition and internal radiant heating rate of water must be correctly specified in order to properly model thermal stratification of stagnant water by radiation. (Humphreys-ISWS)
W75-01206

SOURCES OF NITROGEN AND PHOSPHORUS IN THE LAKE GEORGE DRAINAGE BASIN: A DOUBLE LAKE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5B.
W75-01235

BIOACCUMULATION AND TRANSFER OF 14C-DDT IN A SMALL POND ECOSYSTEM,
Helsinki Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W75-01236

THE INFLUENCE OF SURFACTANTS ON FLOW AT WIND-BLOWN WATER SURFACES,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
W. W. Mansfield.
Chemical Engineering Science, Vol 29, No 7, p 1593 - 1600, 1974. 4 fig, 24 ref, append.

Descriptors: *Surfactants, *Closed conduit flow, *Wind velocity, *Air-water interfaces, *Waves, *Reservoirs, Winds, Boundary layers, Channel flow, Surface tension, Mass transfer, Mathematical studies, Laboratory tests, Flow nets.

The effect of an air-stream on a closed channel of water may be used to simulate the response of water storages to wind. Difficulties have been encountered in explaining the effect of adding surfactants to the water on the relationship between surface velocity and wind velocity. An examination of the behavior of channels of surfactant solutions shows that the flow pattern generated with concentrated solutions is quite different from that obtained with dilute solutions or with pure water. When air blows over a closed channel of water a steady surface velocity develops, as part of a flow extending to the channel bed. With concentrated solutions of surfactants, the surface velocity downwind increases with the cube root of the downwind distance, and the flow is confined to a boundary layer adjacent to the surface. The boundary layer flow is a new type, but is related to that generated by a solid surface moving through a quiescent fluid. The characteristics of this flow are determined experimentally and theoretically, and the importance of surface tension gradients to its genesis and maintenance is developed. (CSIRO)
W75-01244

LONG-TERM BOD DETERMINATIONS ON BIOLOGICALLY TREATED AND UNTREATED KRAFT MILL EFFLUENT DISCHARGED TO LAKE SAIMAA, FINLAND,
National Water Board of Finland, Helsinki. Research Inst.
For primary bibliographic entry see Field 5B.
W75-01264

THE FLOODING OF LAKE PEDDER, FINAL REPORT OF LAKE PEDDER COMMITTEE OF ENQUIRY, APRIL 1974.
Department of the Environment and Conservation, Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-01315

AN EXPERIMENTAL AND ANALYTICAL STUDY OF THERMAL STRUCTURE IN HEATED AND COOLED STAGNANT WATERS,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W75-01324

GULL LAKE: PAST, PRESENT, FUTURE.
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5B.
W75-01327

ALTERATION OF LIPID CONTENT OF TISSUES AND GONOSOMATIC INDICES OF WHITE CRAPPIE BY THERMAL ADDITIONS IN THOMAS HILL RESERVOIR, MISSOURI,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W75-01328

EFFECTS OF CHRONIC OIL CONTAMINATION ON AQUATIC DIPTERANS: A STATE OF THE ART REPORT,
Vermont Univ., Burlington. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W75-01336

STATUS REPORT ON THE WATER LEVELS OF THE GREAT LAKES.
For primary bibliographic entry see Field 6E.
W75-01340

GEOLOGY OF SALARS IN NORTHERN CHILE,
Geological Survey, Reston, Va.
G. E. Stoertz, and G. E. Ericksen.
Available from Sup Doc, GPO, Washington, DC 20402 Price $1.65 (paper cover). Professional Paper 811, 1974. 65 p, 48 fig, 4 tab, 49 ref.

Descriptors: *Deserts, *Saline soils, *Salts, *Playas, Arid lands, Arid climates, Evaporation, Saline lakes, Mineralogy, Hydrogeology, Lake basins.
Identifiers: *Chile, *Salt flats, *Salars.

Northern Chile, which includes the extremely arid Atacama Desert and the semiarid Andean Highlands, has more than 100 basins with interior drainage; most contain salars (salt-encrusted playas). The area of interior drainage totals more than 38,000 square miles, within which salars and clay playas have a total area of about 2,800 square miles. In addition, hills and valleys in the Atacama Desert are extensively covered with saline crusts. The region has many types of hard saline crusts that are generally rare in other deserts, and many morphological and structural salt features, some of which may be unique. Hard salar crusts have formed by deposition of saline material in open water or by capillary migration and evaporation of near-surface groundwater. Crusts may attain thicknesses of a few inches to several tens of feet, and Salar Grande is filled with high-purity rock salt to a local depth of at least 560 feet. Carbonate minerals (for example, trona, calcite, and aragonite) which are widespread in other desert regions are rare in Chile. Of the 67 closed basins in the Andean Highlands of northern Chile, at least 35 show shorelines or deltas of former perennial lakes. They indicate a climate that was either more rainy or cooler, or both, during the time of their formation. It is estimated that perennial lakes would form in nearly all the Andean basins if the mean annual rainfall of the region above 10,000 feet in altitude were increased to 15 inches from its present 8 inches, and if the mean annual temperature were about 2 deg F less than it is at present. (Knapp-USGS)
W75-01351

COMPARATIVE EVALUATION OF TWO METHODS OF CALCULATING PRODUCTION EXEMPLIFIED BY THE ZOOPLANKTON OF LAKE ILMEN, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W75-01394

BIOGEOCHEMICAL CYCLES FOR THE CHEMICAL ELEMENTS IN NYMPHAEA ODORATA AIT. AND THE APHID RHOPALOSIPHYM NYMPHAEAE (L.) LIVING IN LINSLEY POND,
Pittsburgh Univ., Pa. Dept. of Biology.
U. M. Cowgill.

Sci Total Environ, Vol 2, No 3, p 259-303, 1973, Illus.
Identifiers: Aphids, *Aquatic insects, Branford(Conn), *Connecticut(Linsley Pond), Geochemical studies, Macrophytes, *Nymphaea odorata, Ponds, *Rhopalosiphum numphaeae, *Biogeochemical cycles, Lake sediments.

A hydrogeochemical study to determine the abundance of the chemical elements in the water of Linsley Pond, North Branford, Connecticut, U.S.A., was initiated in 1965. As the investigation progressed, it became clear that the aquatic macrophytes, associated sediments and the soils and rocks of the basin had to be examined chemically in order to elucidate the biogeochemical cycle of the elements in the water. This aspect of the study concerns the elemental chemical composition of N. odorata and the aphid R. nymphaeae feeding on its leaves. Elements (35) were detected in the water but 54 were found in this water-lily and its aphid. Those not encountered in lake water concentrated 20-fold were Cs, Sc, Y, Ya, Ce, Pr, Nd, Sm, Gd, Dy, Er, Yb, Ge, Zr, Hf, Th, As, Nb and Se. The water-lily, the aphid, the lake sediment and the soils and rocks of the basin all contained detectable quantities of the rare earths, though beyond Sm only those of even atomic number were encountered. The aphids contained more Na, Li, Cs, Ba, Zn, Al, Ga, Si, Ge, Pb, Ti, Hf, P, Bi, S, Se, Cr, Mo, I, Fe, Co, Ni, Mn, Y, La, Ce, Pr and Sm than the leaves upon which they feed. The water-lily leaves contain more Ag, Ca, Mg, Cd, Hg, B, Sn, Zr, Th, Cl, Br, Nd and Sc than the aphids. The amount of Be, Gd, Dy, Er, Yb, K, Rb, Cu, Sr, As, V and F is essentially the same in the insects as in the leaves which support them. Pertinent comparative data from other sources are also presented.--Copyright 1974, Biological Abstracts, Inc.
W75-01402

INTERDISCIPLINARY STUDY OF LAKE POWELL, USA: CONSEQUENCES OF WATER MANAGEMENT DECISIONS IN AN ARID REGION,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
P. C. Perkins.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 336-345. 2 tab. NSF GI-34835.

Descriptors: *Water resources, *Management, *Projects, *Cooperatives, *Arizona, Social aspects, Environmental effects, Economics, Multiple-purpose projects, Recreation, Decision making, Arid lands.
Identifiers: Interdisciplinary study, *Lake Powell(Ariz).

Described was the organization and operation of an interdisciplinary consortium of natural and social sciences engaged in problem-oriented research on water management in the Lake Powell region. The Lake Powell Research Project features coordinated research in geochemistry, anthropology, law, political science, limnology, epidemiology, environmental impact analysis, systems analysis, economics, and atmospheric science. Using the methodology of systems analysis, the Project considers action variables often at the suggestion of management agencies in the Lake Powell region. For example, the Project treats questions such as the following: How can conflicting demands for water release from Glen Canyon Dam be reconciled with recreational use of the Colorado River in Grand Canyon National Park. What would be the effect of another oil spill on the San Juan River if the oil were to enter the Lake. What will be the impact of the water demands of coal-fired generating plants in the Lake Powell Region. Research results at Lake Powell should also have general application to the industrialization of arid wilderness in other countries. (See also W75-01428) (Humphreys-ISWS)
W75-01461

EFFECTS OF ACIDIFICATION OF SWEDISH LAKES,
Institute of Freshwater Research, Drottningholm (Sweden).
For primary bibliographic entry see Field 5C.
W75-01473

FRESHWATER ECOLOGY,
For primary bibliographic entry see Field 5C.
W75-01475

NAHUEL HUAPI: PLANKTON OF SOME LAKES IN AN ARGENTINE NATIONAL PARK WITH NOTES ON TERRESTRIAL VEGETATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W75-01478

ARAUCANIAN LAKES: PLANKTON STUDIES IN NORTH PATAGONIA, WITH NOTES ON TERRESTRIAL VEGETATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W75-01479

THE EQUILIBRIUM AND STABILITY OF SIMPLE MARINE BIOLOGICAL SYSTEMS. II. HERBIVORES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5C.
W75-01498

SEASONAL CHANGES OF BIOMASS OF BENTHIC ALGAE IN THE LITTORAL OF MIKOLAJSKIE LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology; and Warsaw Univ. (Poland). Zoological Inst.
For primary bibliographic entry see Field 5C.
W75-01504

A PROGNOSIS FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W75-01506

PRIMARY PRODUCTION AND LIMITING NUTRIENTS IN A SMALL, SUBALPINE WYOMING LAKE,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W75-01508

ICE THICKNESS AND VARIABILITY ON SILVER LAKE, GENESEE COUNTY, MICHIGAN: A RADAR APPROACH,
Environmental Research Inst. of Michigan, Flint.
For primary bibliographic entry see Field 2C.
W75-01542

ICE INFORMATION COLLECTION, DISSEMINATION AND USES ON THE GREAT LAKES,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
For primary bibliographic entry see Field 7C.
W75-01556

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION: OBJECTIVE, ORGANIZATION AND EXTENT OF PROGRAM, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 5G.
W75-01599

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION: SURFACE WATER QUALITY OF RECIPIENTS, AUGUST-OCTOBER, 1972, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 5G.
W75-01600

2I. Water In Plants

CAM IN TILLANDSIA USNEOIDES: STUDIES ON THE PATHWAY OF CARBON AND THE DEPENDENCY OF CO2 EXCHANGE ON LIGHT INTENSITY, TEMPERATURE AND WATER CONTENT OF THE PLANT, (IN GERMAN),
Technische Universitaet, Munich (West Germany). Botanisches Institut.
M. Kluge, O. L. Lange, M. V. Eichmann, and R. Schmid.
Planta (Berl). Vol 112, No 4, p 357-372, 1973, Illus, English summary.
Identifiers: *Carbohydrates, *Carbon dioxide, Chloroplasts, *Crassulacean-acid, *Plant biochemistry, Malate, Tillandsia, Vacuoles.

T. usneoides, in the common sense a non-succulent path, exhibits CO2 exchange characterized by net CO2 dark fixation during the night and depression of CO2 exchange during the day. Malate has been demonstrated to accumulate during CO2 dark fixation and to be converted to carbohydrates in light. Thus, T. usneoides exhibits CAM (Crassulacean acid metabolism) like typical succulents. Net CO2 uptake during the day increased with net CO2 output being suppressed in duration of time and extent when light intensity increased. Furthermore, a slight increase in CO2 fixation during the following night was observed if the plants were treated with high light intensity during the previous day. Curves of CO2 exchange typical for CAM were obtained if T. usneoides was kept at 15 deg C and 20 deg C. Lower temperature tended to increase CO2 uptake during the day and to inhibit CO2 dark fixation. Temperatures higher than 20 deg C favored loss of CO2 by respiration, which became apparent during the whole day and night at 30 deg C and higher temperatures. Thus, T. usneoides gained C only at temperatures well below 25 deg C. Net CO2 uptake during the day occurred only in moist plant material and was inhibited in plants kept under water stress conditions. However, CO2 uptake during the night was clearly favored if the plants dried out. Therefore dry plants grained more C than moist ones. Curves of CO2 exchange typical for CAM were also obtained with 13 other species of the genus Tillandsia. The exhibition of CAM by the non-succulent T. usneoides calls for a new definition of the term 'succulence' if it is to remain useful in characterizing this metabolic pathway. It seems useful to investigate parameters which would allow a definition of the term 'succulence' on the level of the cell rather than on the level of the whole plant or plant organs.--Copyright 1974, Biological Abstracts, Inc.
W75-01113

A THEORETICAL APPROACH TO INTERSPECIFIC COMPETITION IN PHYTOPLANKTON COMMUNITIES,
Utah Water Research Lab., Logan.
W. J. Grenney, D. A. Bella, and H. C. Curl, Jr.

Am Nat. Vol 107, No 955, p 405-425, 1973, Illus.

Descriptors: *Speciation, *Competition, *Phytoplankton, Model studies, *Mathematical models.

A 3-compartment mathematical model was developed to represent a phytoplankton population with the capability of storing N in a nitrate-limited environment. Parameters were estimated by fitting the model to equilibrium data from 2 previous chemostat experiments. The model was then run to simulate the transient chemostat conditions, and the model response was compared with the observed data. The model provides a reasonable representation of the sudden population surges associated with intracellular nutrient storage. Temporal variations in environmental conditions are a predominant mechanism influencing an organism's ability to compete and coexist with its competitors. Competition was studied by using a mathematical model which incorporates intracellular nutrient storage. The model demonstrates the effect of flow variations on the competitive ability of 2 hypothetical species. Temporal variations in flow were characterized by 3 parameters: period, amplitude and percentage of time high flow occurs; regions of coexistence were described in terms of these. Temporal variations in nutrient supply also affect competitive ability. Provided that a suitable combination occurs with sufficient frequency and duration, a species may be able to survive indefinitely. One of the most subtle dangers to a dynamically balanced system of this type is the removal of the complex temporal variations. Considering man's encroachment on the environment, concern must be shown not only for what is added to or withdrawn from natural system, but also for the possibility of significantly dampening the fluctuation of environmental forces.--Copyright 1974, Biological Abstracts, Inc.
W75-01114

VEGETATION OF THE EARTH IN RELATION TO CLIMATE AND ECO-PHYSIOLOGICAL CONDITIONS,
H. Walter.
Springer-Verlag: New York, 1973, 237 p, Illus, Heidelberg Science Library, Vol. 15.

Descriptors: *Plant population, *Climate, *Vegetation, *Ecosystems.

This book, translated from the 2nd German edition, discusses the eco-physiological aspects of field botany on a continental scale, providing an overview of the plants and vegetation of the earth. New data on biomasses are provided which summarize results of physiological processes of different kinds of vegetation and express their structure. Ecological principles are applied to land management, including agriculture, forestry, range and pasture management and natural area maintenance. After an introductory chapter covering floristic realms, competition in plant communities and climatic zones of the earth, discussion is included on evergreen tropical rain forest zone, vegetation of the tropical summer-rain zone and subtropical semidesert and desert zones. Chapters follow about sclerophyllous vegetation of the regions with winter rains, the warm-temperate vegetational zone, nemoral zone or deciduous forest zone in temperate climates and the arid vegetational regions of the temperate climatic zone. A discussion is presented on the arctic tundra zone and the alpine vegetation of mountainous regions.--Copyright 1974, Biological Abstracts, Inc.
W75-01116

ROLE OF PHYSIOLOGICAL PLANT ACTIVITY IN ADAPTIVE INCREASE IN DROUGHT RESISTANCE: 1. EFFECT OF HEAT REGIMES ON MOISTENED GERMINATING WHEAT SEEDS, (IN RUSSIAN),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
For primary bibliographic entry see Field 3F.
W75-01150

PHOSPHORUS COMPOUNDS IN CORN TISSUES UNDER UNFAVORABLE CONDITIONS OF MOISTENING, (IN RUSSIAN),
Kazan Agricultural Inst. (USSR).
For primary bibliographic entry see Field 3F.
W75-01151

FUNCTIONAL ACTIVITY OF RIBOSOMES IN WHEAT AND BEAN PLANTS HARDENED AGAINST DROUGHT, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
For primary bibliographic entry see Field 3F.
W75-01156

AMINO ACID COMPOSITION OF FRESHWATER ALGAE,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W75-01238

FRUITFULNESS IN GRAPE-VINES: EFFECTS OF WATER STRESS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 3F.
W75-01242

A COMPARATIVE STUDY OF THE HYDROLOGY OF RABIATA PINE AND EUCALYPT FORESTS AT LIDSDALE, NEW SOUTH WALES,
New South Wales Dept. of Environment, Sydney (Australia).
M. K. Smith, K. K. Watson, and D. H. Pilgrim.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 82-86, 1974. 4 fig, 2 tab, 25 ref.

Descriptors: *Water balance, *Forest watersheds, *Rainfall-runoff relationships, Watersheds(Basins), *Pine trees, Interception, Runoff, Soil moisture, Evaporation, Evapotranspiration, Forests, Estimating equations, Mathematical models, Hydrologic data, Australia.
Identifiers: New South Wales, *Pinus radiata, *Eucalypt species.

In two paired catchments, one timbered with Radiata Pine and the other with native Eucalypt forest, detailed measurements of precipitation, interception, runoff and soil moisture over a period of 31 months allowed detailed comparison of their water balances. Interception was higher and runoff lower in the pine catchment. The average soil moisture contents for the two catchments varied from each other during wet and dry periods, but were similar for the remainder of the observations. Relationships were derived for each catchment between actual evapotranspiration calculated from the water balance, measured available soil moisture, and Penman's method for free water evaporation. The results tentatively indicate that Penman's method may not apply to Australian forest areas. The data obtained are useful for testing the validity of mathematical models of the rainfall-runoff process. (CSIRO)
W75-01250

MANAGEMENT OF PHREATOPHYTE AND RIPARIAN VEGETATION FOR MAXIMUM MULTIPLE USE VALUES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-01382

A WHEELED DEVICE FOR SAMPLING THE BIOTA OF A CONCRETE-LINED CANAL,
Bureau of Relamation, Tracy, Calif.
For primary bibliographic entry see Field 7B.
W75-01487

MICROELECTRODES SUITABLE FOR USE IN CELLS WITH HIGH HYDROSTATIC PRESSURE,
State Univ. of New York Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 7B.
W75-01596

LIFE HISTORY OF THE TAILLIGHT SHINER, NOTROPIS MACULATUS IN CENTRAL FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
B. C. Cowell, and B. S. Barnett.
Am Midl Nat, Vol 91, No 2, p 282-293, 1974, Illus.
Identifiers: Algae, Alonella-globulosa, Chironomid, Cladocera, Copepod, Fecundity, *Florida, Heleidae, History, Larvae, Notropis-maculatus, Ostracod, Rotifer, *Shiner(Taillight), *Spawning, *Aquatic insects.

Spawning of the taillight shiner in central Florida, occurred from March to early Oct. at water temperatures of 23-32 C; major periods of activity occurred in early spring, late spring and late summer. Fecundity of gravid females ranged from 72-408 ova/female and was positively correlated with total length. Fertilized eggs, held at 23 C in laboratory aquaria, were demersal and adhesive and hatched within 60-72 h. Larval taillight shiners were pelagic. Growth and maturation of taillight shiners were rapid but varied depending upon time of hatching. The spring (1970) group of young-of-the-year reached 40.2 mm in total length by Aug., was reproductively mature, and subsequently spawned; the early summer group was approximately 39 mm by Oct. but did not mature until the following April; and the late summer group grew throughout the winter but did not reach 40 mm or reproductive maturity until April. Post-spawning mortality of 1-yr-old fish occurred over a 2- or 3-mo. period following the 2nd spawning. Food consisted of algae, rotifers, copepods, cladocerans, ostracods and insects. However, utilization of food items varied with fish size. Larval shiners fed on rotifers, fish 20-40 mm long fed primarily on the cladoceran, Alonella globulosa and larger fish (>40 mm) fed predominantly upon insect larvae. Electivity indices indicated that all sizes of taillight shiners were highly selective for large algal cells. Copepods were rejected by fish smaller than 40 mm, but selection increased in larger sizes. The cladoceran, A. globulosa, was consumed in about the same proportions as available, and Chironomidae and Heleidae larvae apparently were positively selected by larger fish.--Copyright 1974, Biological Abstracts, Inc.
W75-01602

INFLUENCE OF RESTRICTED WATER SUPPLY ON BLOSSOM-END ROT AND IONIC COMPOSITION OF TOMATOES GROWN IN NUTRIENT SOLUTION,
Institute for Soil Fertility, Groningen (Netherlands).
For primary bibliographic entry see Field 3F.
W75-01612

EFFECT OF MOISTURE CONTENT ON ANTIBIOTIC ACTIVITY OF PLANTS, (IN BELRUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralny Botanichny Sad.
For primary bibliographic entry see Field 3F.
W75-01613

A METHOD FOR THE DETERMINATION OF THE CALORIC CONTENT OF SESTON, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 7B.
W75-01614

FRICTIONAL POTENTIAL LOSSES AND TOTAL WATER POTENTIAL IN PLANTS: A RE-EVALUATION,
Hochaschule fuer Bodankulture, Vienna (Austria). Botanisches Institut.
H. Richter.
J Exp Bot, Vol 24, No 83, p 983-994, 1973, Illus.
Identifiers: *Water potential(Plants), *Water loss(Plants), Equations, *Water flow(Plants).

A theoretical treatment is given of isothermal potential losses due to frictional resistances against water flow in plants. In the past 2 main difficulties have been widely ignored or misinterpreted: the proper choice of dimensions for fluxes and resistances; and the original van den Honert concept. A revised equation is presented for total water potential at a certain point in the plant, and some implications of this approach are outlined.--Copyright 1974, Biological Abstracts, Inc.
W75-01617

THE EFFECT OF WATER TEMPERATURE ON THE PENETRATION AND DEVELOPMENT OF ST. LUCIAN SCHISTOSOMA MANSONI MIRACIDIA IN LOCAL BIOMPHALARIA GLABRATA,
Saint Lucia Research and Control Dept., Castries.
E. S. Upatham.
Southeast Asian J Trop Med Public Health, Vol 4, No 3, p 367-370, 1973, Illus.
Identifiers: *Biomphalaria-glabrata, *Miracidia, *Schistosoma-mansoni, Vectors, *Water temperature, *West Indies(St. Lucia), *Snail infection.

The effect of water temperature on the initial penetration of B. glabrata by S. mansoni miracidia and the subsequent development of the miracidia into sporocysts in the snails were studied. Snails were exposed for 1 h to miracidia at temperatures ranging from 10-40C at 3C intervals. No infection occurred in snails exposed to miracidia at 10C and 13C. The snail infection rates rose with increasing temperatures, from 14.3% at 16C to a peak of 71.4% at 34C, and then decreased to 10% at 40C. The optimum range for a high snail infection rate and a high production of daughter sporocysts in snails was between 25C and 34C. Snails exposed to mirachidia at temperatures of 37C and 40C had high rates of mortality. In general, extreme temperatures likely to interfere with the infection of B. glabrata by S. mansoni do not occur in habitats on St. Lucia (West Indies) where a year-round range of 22-30C is fairly common. Excessively high temperatures during the summer months of the year could reduce transmission in some habitats, but are unlikely to eliminate it entirely.--Copyright 1974, Biological Abstracts, Inc.
W75-01618

DRIFTING BEHAVIOR OF EPHEMERELLA IGNITA (EPHEMEROPTERA), (IN GERMAN),
I. Butz.
Oikos 24(3): 469-472, Illus. 1973. English summary.
Identifiers: Behavior, *Ephemerella-ignita, Fluviarium, *Aquatic drift, *Mayflies, *Aquatic insects.

The drifting behavior of mature nymphs of E. ignita Poda was observed in a fluviarium. The current resistance is slight. At 7 cm/s the nymphs moved out of the current and at 10 cm/s no movement was possible without drift. The preference for calm water and the characteristic drift behavior of nymphs in open water, enables this species to inhabit running water.--Copyright 1974, Biological Abstracts, Inc.
W75-01636

SAMPLING INVERTEBRATES ACTIVE BELOW A SNOW COVER,
Bergen Univ. (Norway). Zoological Museum.
For primary bibliographic entry see Field 7B.
W75-01649

2J. Erosion and Sedimentation

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W75-01161

STREAM GRADIENT AS A FUNCTION OF ORDER, MAGNITUDE, AND DISCHARGE,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W75-01306

STRATIGRAPHY OF AN ARCHEOLOGICAL SITE, OCMULGEE FLOOD PLAIN, MACON, GEORGIA,
Geological Survey, Doraville, Ga.
O. J. Cosner.
Available from NTIS, Springfield, Va. 22161 as PB-232 763/As, $3.75 in paper copy, $2.25 in microfiche. Water-Resources Investigations 54-73, November 1973. 27 p, 11 fig, 3 tab, 7 ref.

Descriptors: *Flood plains, *Stratigraphy, *Georgia, *Archaeology, Alluvium, Alluvial channels, Sedimentation.
Identifiers: *Ocmulgee River(Ga), *Macon(Ga).

Archeological excavations on the Ocmulgee River flood plain at Ocmulgee National Monument, Georgia, revealed eight sedimentary units of Holocene age. Types of deposits found are natural levee, overbank deposit, and a probable point bar. Since the 18th century, locally more than 10 feet of sediment has been deposited. These modern sediments are similar to those on other flood plains in the southeastern United States and probably resulted from erosion that began when extensive areas were laid bare for farming. They are red to reddish brown in contrast to underlying sediment, which is various shades of gray, brown, and yellow. Earliest traces of man are 'spinner-type' projectiles in the lower sand member. Marrow mountain-type points are found in mottled silty sandy clay. Triangular stemmed Savannah River points were found throughout the intermediate sand. Fiber tempered pottery shards and steatite bowls were found in the upper one-half of the intermediate sand member. (Knapp-USGS)
W75-01365

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. F. Ruff, J. W. Keys, III, and M. M. Skinner.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 349-356. 2 fig, 1 ref.

Descriptors: *Remote sensing, *Water resources development, Sediment load, Water temperature, Sediment discharge, Aerial photography, Surveys, Analytical techniques, Rivers, *Montana, *Wyoming.
Identifiers: Clarks Fork Yellowstone River(Mont-Wyo).

Purposes of the study were: (1) to locate the points at which sediment loads are discharged into the river, (2) to estimate the relative magnitude of sediment concentrations in the river and tributary flows, and (3) to show the usefulness of aerial remote sensing techniques (color infrared photography and thermal imagery) in monitoring and studying sediment movements in a river system. The results indicated that aerial color infrared photography and thermal infrared imagery are practical tools for locating and identifying existing and potential inflows of sediment-laden water to a river system. Color infrared photography was best for identifying sediment concentration differences. Thermal infrared imagery provided an indication of the relative temperature. Together they provided a unique, quasi-synoptic view of of the sediment transport process in a river system. It should be recognized, however, that a flight of this kind was a 'one-shot' view of the river system characteristics. Only the conditions for a single set of flow relationships among the river and its tributaries were observed, thus the overall picture could change with different flow conditions. For example, turbidities, temperatures, and sediment concentrations would vary in unique patterns for different flow conditions resulting in changing spectral signatures sensed by the remote detecting systems. Research should be continued in attempts to quantify these three factors by improving the interpretive techniques of analyzing data collected by remote sensors. (See also W75-01428) (Humphreys-ISWS)
W75-01462

DETERMINATION OF MERCURY FROM LAKE SEDIMENTS,
National Swedish Environmental Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 5A.
W75-01598

SOME CHEMICAL ASPECTS OF THE HUMUS OF UNDERWATER SEDIMENTS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
G. Cedeno-F., and T. Okuda.
Bol Inst Oceanogr Univ Oriente Cumana, Vol 10, No 1, p 9-16, 1971(1973), Illus. English summary.
Identifiers: Carbohydrates, Carbon, *Chemical studies, *Humus, Nitrogen, Sediments, *Venezuela.

Some chemical characteristics of the humus in subaquatic sediments sampled from the various coastal areas of northeastern Venezuela are discussed. Four fractions of humus were extracted with 4% NaOH. The muddy sediments are more abundant in humus and in fish fraction. It is rich in the organic matter containing 50.1% organic C, 3.8% organic N and 20.7% carbohydrates. The fish fraction is formed by complex structured molecules containing lignoproteic-carbohydrates. The IR spectrum of the fish fraction confirms the presence of an extensive mixing component. The spectrum of the fish fraction and of the benzene extract showed great similarity.--Copyright 1974, Biological Abstracts, Inc.
W75-01603

2K. Chemical Processes

WATER RESOURCES DATA FOR KANSAS, 1973: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W75-01160

AN INVENTORY OF PUBLISHED AND STORED CHEMICAL ANALYSES OF SURFACE WATER IN CALIFORNIA, 1906-71,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.

W75-01178

WATER IN THE METHOW RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4A.
W75-01181

A STUDY OF CHEMICALS IN DRINKING WATER FROM SELECTED PUBLIC WATER SYSTEMS, NEW YORK STATE, OCTOBER 1970 TO MARCH 1971.
New York State Department of Health, Albany. Water Supply Section.
For primary bibliographic entry see Field 5A.
W75-01182

A CRITICAL ANALYSIS OF WARBURG RESPIROMETRY FOR BOD DETERMINATIONS OF POLLUTED RIVERS,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5A.
W75-01217

ANOMALOUS PROPERTIES OF SUPERCOOLED WATER. HEAT CAPACITY, EXPANSIVITY, AND PROTON MAGNETIC RESONANCE CHEMICAL SHIFT FROM 0 TO -38 (DEGREES),
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 1A.
W75-01228

CHEMISTRY,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-01230

THE SELF-DIFFUSION COEFFICIENTS OF 45CA AND 2,4-DICHLOROPHENOXYACETIC ACID,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01233

EFFECT OF PORE SIZE ON DIFFUSION COEFFICIENTS IN POROUS MEDIA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01234

METHODS FOR ANALYSIS OF IRRIGATED SOILS.
Commonwealth Agricultural Bureaux Slough (England); and Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
For primary bibliographic entry see Field 2G.
W75-01239

THE CHEMISTRY AND TRANSPORT OF LEAD AND CADMIUM IN SOILS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5B.
W75-01335

GEOLOGY OF SALARS IN NORTHERN CHILE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W75-01351

MAP SHOWING CHLORIDE-ION CONCENTRATION IN SEDIMENTARY ROCKS OF PERMIAN (GUADALUPIAN) AGE, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W75-01352

THE NATURAL QUALITY OF GROUND WATER IN MINNESOTA,
Geological Survey, St Paul, Minn.
T. C. Winter.
Minnesota Division of Waters, Soils and Minerals Bulletin 26, April 1974. 25 p, 9 fig, 14 ref.

Descriptors: *Water quality, *Water chemistry, *Minnesota, *Groundwater, Hydrogeology, Aquifer characteristics, Sulfates, Bicarbonates, Calcium, Chlorides, Sodium.

Groundwater occurs in four hydrogeologic environments in Minnesota--in fractures in crystalline rocks, in Paleozoic sedimentary rocks, in Cretaceous sedimentary rocks, and in glacial drift. The movement of water through and the chemical and mineralogic properties of these rocks results in distinct water-quality types in different parts of the State. Calcium magnesium bicarbonate type water occurs throughout and predominates in the eastern three-fourths of the State. Calcium magnesium sulfate, sodium bicarbonate, and sodium chloride types occur in complex vertical and areal relationships in west Minnesota. Water having dissolved-solids content greater than 1,000 milligrams per liter is limited largely to northwest and southwest Minnesota, where types other than calcium magnesium bicarbonate are common. (Knapp-USGS)
W75-01362

A ROUTINE METHOD FOR THE DETERMINATION OF ARSENIC IN PLANTS, SEDIMENTS, AND NATURAL WATERS,
Department of Scientific and Industrial Research, Palmerston North (New Zealand).
For primary bibliographic entry see Field 5A.
W75-01376

THE RIBOFLAVIN SENSITIZED PHOTOINACTIVATION OF ISOCITRIC DEHYDROGENASE,
Auburn Univ., Ala. Dept. of Chemistry.
C.-S. Lee.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 531, $4.25 in paper copy, $2.25 in microfiche. MS Thesis, June 1973, 52 p, 12 fig, 2 tab, 48 ref, append. OWRT A-035-ALA(1).

Descriptors: *Enzymes, *Vitamin B, Aqueous solutions, Kinetics, Dissolved oxygen, Oxidation, Energy transfer.
Identifiers: *Isocitric dehydrogenase, *Riboflavin, Photoinactivation, Photooxidation, Photochemical processes.

The photoinactivation of the enzyme isocitric dehydrogenase sensitized by riboflavin has been studied in aqueous solution. The kinetic investigation showed that the rate of inactivation proceeded rapidly in the first twenty minutes and then decreased progressively at a longer time of illumination. This behavior could result from depletion of dissolved oxygen in the solution during the photooxidation. The inhibiting effect of added substances including cobalt ions and iodide ions indicates the participation of riboflavin triplet state in the inactivation reaction. A phosphorescence band from a rigid glass of riboflavin supports the existence of such a reactive species. Energy transfer in aqueous solutions may be of great importance in photochemical processes. However, attempts to correlate energy transfer with photooxidation in the reaction system were unsuccessful. Binding interactions between riboflavin and the enzyme could occur in these reaction mixtures. A shorter lifetime of riboflavin after addition of ICDH demonstrates such a possibility. The results do not conform fully with any one of the several mechanisms that have been proposed to explain photodynamic action.
W75-01384

MULTIRESIDUE METHOD FOR THE DETERMINATION OF TRIAZINE HERBICIDES IN FIELD-GROWN AGRICULTURAL CROPS, WATER, AND SOILS,
CIBA-GEIGY Ltd., Basel (Switzerland). Agrochemical Div.
For primary bibliographic entry see Field 5A.
W75-01503

THE ECOSYSTEM CONCEPT FOR DETERMINING THE IMPORTANCE OF CHEMICAL COMPOSITION OF SNOW,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 2C.
W75-01535

CHEMICAL COMPOSITION OF AN ANTARCTIC SNOW PROFILE,
Bergen Univ. (Norway). Geofysisk Institutt.
For primary bibliographic entry see Field 2C.
W75-01597

SOME CHEMICAL ASPECTS OF THE HUMUS OF UNDERWATER SEDIMENTS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2J.
W75-01603

POSSIBILITIES OF THE 'CARBON ROD' TECHNIQUE FOR THE DETERMINATION OF TRACE ELEMENTS IN WATER BY ATOMIC ABSORPTION,
Rijksfaculteit der Landbouwwetenschappen, Ghent (Belgium).
For primary bibliographic entry see Field 5A.
W75-01619

DETERMINATION OF CHROMIUM IN WATER AND WASTE WATER (BESTIMMUNG DES CHROMS IN WASSER UND ABWASSER),
For primary bibliographic entry see Field 5A.
W75-01641

THE USE OF CHELATING ION EXCHANGE IN CONJUNCTION WITH RADIOISOTOPE X-RAY SPECTROMETRY FOR DETERMINATION OF TRACE AMOUNTS OF METALS IN WATER,
Institute of Nuclear Physics and Techniques, Krakow (Poland).
For primary bibliographic entry see Field 5A.
W75-01644

2L. Estuaries

ZONES OF NITRIFICATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W75-01103

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY,
Geological Survey, Reston, Va.
L. J. Mansue, and A. B. Commings.
Available from GPO, Washington, D C 20402. Price $0.40 (paper cover). Water-Supply Paper 1532-H, 1974. 18 p, 2 fig, 5 tab, 18 ref.

Descriptors: *Sediment transport, *Sediment yield, *Delaware River, *Land use, *Sediment load, Erosion, Urbanization, Construction, Estuaries, Delaware, Pennsylvania, New Jersey.
Identifiers: *Delaware Estuary, *Delaware River basin.

The quantity of sediment transported by streams draining into the Delaware estuary varies areally according to geology, physiography, and land use. Of the estimated total sediment load of 1.6 million tons entering the Delaware estuary annually, about 48% is contributed by the Delaware River at Trenton, N. J.; 34% by Pennsylvania tributaries; and 18% by New Jersey and Delaware tributaries. The basins yielding the most sediment are in the Piedmont province in Pennsylvania and Delaware, where sediment yields range from 100 to 1,000 tons per square mile annually. Inner Coastal Plain basins in New Jersey and Delaware yield from 50 to 250 tons per sq mi annually. Basins carrying the least sediment (5-10 tons per sq mi annually) are in the Outer Coastal Plain in southern New Jersey and Delaware. Many of the tributaries in the lower Delaware River basin flow through areas that are urbanized or are undergoing urbanization. Basins draining stabilized urban areas have yields similar to those in areas not urbanized. Streams draining areas in the development phases of urbanization, where exposure of soils by earth moving have produced a readily erodible source, have yields two to four times higher than those in adjacent nonurban or stable urban areas. (Knapp-USGS)
W75-01161

LITTORAL FLOW TRAP OR BASIN,
Butterworth (Helen Libbey), Smithfield, Va. (assignee)
For primary bibliographic entry see Field 8B.
W75-01198

A STUDY TO PREDICT THE EFFECTS OF THERMAL ADDITIONS IN THE BAY RIVER AND NEUSE RIVER AREA OF NORTH CAROLINA,
Research Inst. of the Gulf of Maine, Portland.
For primary bibliographic entry see Field 5C.
W75-01208

ZINC, CADMIUM, COPPER AND MANGANESE IN SPECIES OF FINFISH AND SHELLFISH CAUGHT IN THE DERWENT ESTUARY, TASMANIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W75-01243

CHALMETTE PUBLIC HEARINGS TESTIMONY, (LOUISIANA).
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 4A.
W75-01344

ANNUAL REPORT JULY 1971 THROUGH DECEMBER 1972,
North Carolina Univ., Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 6B.
W75-01348

THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION: ITS CAPACITY TO IMPLEMENT AN INTERNATIONAL DECADE OF OCEAN EXPLORATION,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W75-01349

SHALLOW-WATER ZONATION OF SEA-LOCH BENTHOS AND ITS RELATION TO HYDROGRAPHIC AND OTHER PHYSICAL FEATURES,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. Gage.
J Mar Biol Assoc U K. Vol 54, No 1, p 223-249, 1974, Illus.

Descriptors: *Benthos, *Distribution patterns, *Benthic fauna.
Identifiers: Clustering, Hydrographic studies, Physical features, *Salinity, *Sea locks, Sediments, Shallow water, *Temperature, Waves, *Zonation.

The vertical distribution of the benthic fauna associated with soft sediments in sea-lochs was investigated by divers taking pairs of core samples at a series of depth levels along a transect from the shore out to a maximum depth of 25 m. Eight transects were worked, 5 in Loch Etive, 2 in Loch Creran and 1 in an adjacent area in Lochnell Bay outside the 2 lochs. The samples from each transect were objectively classified into hierarchical groupings by applying a clustering strategy to the values of an index of faunal similarity derived from the species abundances data. An attempt is made to relate the structures shown to physical differences measured along the transect in terms of depth, topography, sediment granulometry and exposure. In Loch Etive, the groupings were best correlated with the pattern of intense vertical gradients in salinity and temperature. These are caused by a semi-permanent depression of surface salinity by terrestrial drainage. The faunal distributions showed best correlation with the degree of fluctuation of salinity, measured near the transect sites in a long-term hydrographic study, rather than with its mean value. The range and speed of salinity fluctuations probably primarily control the observed pattern of vertical zonation of the typically estuarine and euryhaline marine species found in the samples. In Loch Creran and Lochnell Bay, the groupings may best be related to a complex of unstable conditions including wave exposure, sediment type and occasionally reduced surface salinity.--Copyright 1974, Biological Abstracts, Inc.
W75-01472

PRIMARY PRODUCTIVITY OF ROOTED MACROPHYTES IN THE LITTORAL ZONE OF LAKE GEORGE,
Rensselaer Polytechnic Inst. Troy, N.Y. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-01490

THE EQUILIBRIUM AND STABILITY OF SIMPLE MARINE BIOLOGICAL SYSTEMS. II. HERBIVORES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5C.
W75-01498

SPRING RUN-OFF INTO MASSACHUSETTS BAY, 1973,
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
For primary bibliographic entry see Field 5B.
W75-01509

DISSOLVED NUTRIENT-SEAWATER DENSITY CORRELATIONS AND THE CIRCULATION IN BOSTON HARBOR AND VICINITY,
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
J. Karpen.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-74-10407, $7.25 in paper copy, $2.25 in microfiche. Part II of: Spring Run-off and Nutrient-Seawater Density Correlations in the Massachusetts Bay, Report No MITSG 74-9, November 1973. 108 p, 59 fig, 8 tab, 19 ref. NOAA NG-43-72.

Descriptors: *Bays, *Circulation, *Nutrients, *Dispersion, Sea water, Density, Massachusetts, Tides, Currents(Water), Mathematical models.
Identifiers: *Massachusetts Bay, *Boston Harbor(Mass).

This beginning study of the circulation of Massachusetts Bay evolved a theoretical model for concentration of a source of flux in the harbor mouth. Hydrographic data was summarized in vertical sections, the nutrient data in horizontal sections. The water enters Massachusetts Bay as a jet (ebb tide), on the flood tide flows into the harbor as a potential sink. Field work was undertaken to determine the actual distribution of a source of dissolved nutrients, verify the dispersion theory, and determine if it is feasible to specify what the dissolved nutrient distribution should be by measuring the density distribution. The Deer Island Sewage Treatment Plant effluent outfall, located at the mouth of the harbor, was used as a tracer of harbor water. An exchange theory using simplified jet and sink flows was developed to predict the effluent concentrations in the harbor. A significant correlation was found between dissolved nutrient concentrations and sigma-t (density). It appears that the harbor water mass moves seaward into Massachusetts Bay as a large, fairly homogenous volume, 'blob', a new blob moving into the bay on each ebb tide. (See also W75-01509) (Jones-Wisconsin)
W75-01510

DETERMINATION OF WATER QUALITY PARAMETERS IN THE MASSACHUSETTS BAY (1970-1973),
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-01511

FLAX POND: AN ESTUARINE MARSH,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5C.
W75-01513

AN ESTIMATE OF BENTHIC MACROFAUNAL PRODUCTION IN THE OFFSHORE MUD OF THE NORTHUMBERLAND COAST,
Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
J. B. Buchanan, and R. M. Warwick.
J Mar Biol Assoc U K, Vol 54, No 1, p 197-222, 1974, Illus.
Identifiers: Abra-nitida, Ammotrypane-aulogaster, *Benthic fauna, Biomass, Brissopsis-lyrifera, Calocaris-macandreae, Chaetozone-setosa, Coasts, Glycera-rouxi, Heteromastus-filiformes, Lumbrineris-fragilis, Mortality, *Mud, Offshore, *Production, Spiophanes-kroyeri, *United Kingdom(Northumberland).

The macrofauna population of a silty-bottom station at a depth of 80 m off the coast of Northumberland (United Kingdom) was studied over the period Jan. 1971 to Jan. 1972. Species was counted, divided into year groups and the biomass of each year group estimated as ash-free dry weight. Estimates of species productivity were made by computing mortality and biomass. Eighteen species account for 90% of all animals, 12 being polychaetes. Although Calocaris macandreae is the single biomass dominant, polychaetes are responsible for the bulk of the biomass. In biomass ranking, the 1st 3 spp. were stable. Changes in the lower ranks were caused by declining numbers of Ammotrypane aulogaster and Abra nitida. A slight increase in diversity throughout the year was detected, with a general increase in equitability and decrease in dominance. The rarefaction curve is compared with others from North Sea stations and from the Puget Sound area. The biomass averaged 3.98 g/sq m, and was slightly lower in winter (3.4-3.8 g) than summer (4.2-4.5 g). Nine large species with individual weights over 100 mg occurred only sporadically in small numbers and accounted for 22% of the total biomass. Of the remaining 52 smaller species, 10 occur in

sufficiently high numbers for their production to be estimated. These 10 account for 86.2% of the biomass of the <100 mg category. In order of production they are: Ammotrypane aulogaster, Heteromastus filiformis, Spiophanes kroyeri, Glycera rouxi, Calocaris macandreae, Abra nitida, Lumbrineris fragilis and Chaetozone setosa. The population dynamics of each is discussed and their total production estimated at 1432 mg/sq m/yr. The residual 13.8% by weight of smaller individuals is estimated to produce 198 mg/sq m/yr. The only large species considered to be a significant producer is Brissopsis lyrifera (108 mg/sq m/yr). The estimated total production for all species is 1738 mg/sq m/yr.--Copyright 1974, Biological Abstracts, Inc.
W75-01601

SOME PROBLEMS OF A HYGIENIC INVESTIGATION OF COASTAL WATERS, (IN RUSSIAN),
Azov-Volga-Don Water Health Dept., Rostov-na-Donu (USSR). Basin Sanitary Epidemiological Station.
For primary bibliographic entry see Field 5A.
W75-01623

NUMERICAL ANALYSIS ON UNSTEADY DISPERSION IN RIVER,
Osaka Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-01646

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER STILL,
For primary bibliographic entry see Field 5F.
W75-01185

FREEZE CRYSTALLIZATION OF SALINE WATER WITH A DIRECT CONTACT REFRIGERANT,
United Kingdom Atomic Energy Authority, London (England). (assignee)
J. H. Wilson.
U S Patent No 3,835,658, 3 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 789, September 17, 1974.

Descriptors: *Patents, *Desalination, *Refrigeration, Saline water, Heat exchangers, Ice, Evaporation, Equipment, Sea water.
Identifiers: *Freeze crystallization, Liquid natural gas, Liquid methane.

A method is provided for the desalination of saline water by freezing. The steps are as follows: a mixture is formed of ice and concentrated saline water by cooling the saline water by heat exchange with an evaporating liquid refrigerant; the separated ice is melted so as to obtain fresh water; a portion of the evaporated refrigerant is reliquified by heat exchange with an aqueous solution in a condenser; and the aqueous solution is cooled by heat exchange with liquid methane or liquid natural gas. The apparatus comprises a crystalliser in which a mixture of ice and concentrated saline water is formed by cooling the saline water by heat exchange with an evaporating liquid refrigerant, a wash column in which the ice is separated from the concentrated saline water, a melter in which the separated ice is melted, a condenser for reliquifying a portion of the evaporated refrigerant by heat exchange with an aqueous solution, and a heat exchanger for cooling the aqueous solution with liquid methane or liquid natural gas. (Sinha-OEIS)
W75-01197

3B. Water Yield Improvement

WAMIS--AN AID IN LOCATING INFORMATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 10A.
W75-01219

LOW REYNOLDS NUMBER SUBLIMATION OF BLOWN SNOW,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W75-01337

HUNGRY HORSE CLOUD SEEDING PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bonneville Power Administration, Portland, Oreg.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-MT-73-2025-F, $8.75 in paper copy, $2.25 in microfiche. December 17, 1973. 356 p, 11 fig, 7 tab, 1 append.

Descriptors: *Environmental effects, *Montana, *Cloud seeding, *Snow management, *Stream flow, Natural flow, River flow, Surface runoff, Streamflow forecasting, Surface runoff, Silver iodide, Snow pack, Snow cones, Snow surveys, Water yield improvement, Hydro-electric plants, Electric power production, Balance of nature, Wildlife, Vegetation, Soil erosion, Runoff forecasting.
Identifiers: *Environmental Impact Statements, *Flathead and Lake Counties(Mont).

A cloud seeding project in Flathead and Lake Counties, Montana, is directed toward the maintenance of normal snowpack conditions in the basin of the South Fork of the Flathead River above Hungry Horse Dam. The purpose is to alleviate a projected shortage of firm energy in the Pacific Northwest by assuring normal streamflows and hydroelectric generation. An increase of up to 10 percent in snow pack in the winter of 1973-74 over a 1,034,600 acre target area is possible. Increased precipitation may cause transitory and minor impacts on wildlife, vegetation, soil erosion, and streamflow. Some inconveniences to local residents may occur. These effects will be in the normal range of natural snowfall variations. Approximately 13 pounds of silver iodide will be released. In the event of a heavy late-season snow fall, the snowpack resulting from the proposed project could contribute to heavier-than-normal run off. Some additional precipitation might be induced in downwind areas possibly including Glacier National Park. Alternatives considered are: no cloud seeding program, including use of other generation sources and reduction in consumption of electricity; alternative methods of cloud seeding; cloud seeding of other areas; and delay of the cloud seeding operation. No irreversible commitment of resources is made by this project. (Kelly-Florida)
W75-01347

MANAGEMENT OF PHREATOPHYTE AND RIPARIAN VEGETATION FOR MAXIMUM MULTIPLE USE VALUES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. S. Horton, and C. J. Campbell.
Research Paper RM-117, April 1974. 23 p, 6 illus, 1 tab, 90 ref.

Descriptors: *Phreatophytes, *Water yield improvement, *Southwest US, *Vegetation effects, *Riparian plants, *Trees, *Land management, Soil management, *Riparian water loss, *Evapotranspiration, Water table, Evapotranspiration control, Water yield, Water loss, *Reviews, Vegetation, Ecology, Management.

A summary is presented of knowledge about environmental relations of vegetation along water courses in the southwestern U.S.A., and about impacts of vegetation management to reduce evapotranspiration on other resource values. A review is made of scientific literature pertaining to the measurement and evaluation of water losses from moist-site vegetation, ecological relationships, other resource uses of phreatophyte and riparian areas, and control methods. Approaches to management of moist-site areas are suggested, based primarily on water table depth, elevation, and tree species.
W75-01382

SOME WATER RESOURCES PROBLEMS AND HUMAN ENVIRONMENT,
Haryana Public Works Dept., Chandigarh (India), Irrigation Works.
For primary bibliographic entry see Field 4A.
W75-01436

A WATER STORAGE METHOD BASED ON HUMAN ENVIRONMENT,
Asian Inst. of Tech., Bangkok (Thailand).
S. Pinkayan.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 426-432. 3 fig, 1 tab, 1 ref.

Descriptors: *Water resources, *Water resources development, *Water supply, Rain water, *Water storage, Water balance, Water tanks, Water quality, Water users, Human population, Rural areas, Roofs, Cisterns.
Identifiers: *Human environment, Developing countries, *Thailand.

People living in remote areas of developing countries generally believe rain water is the cleanest. Tap water is considered to be second class. The problem of using rain water is that rain falls during a certain period of the year only. A water balance was studied by using daily rainfall in Thailand on a house roof as the input going into a storage tank and daily consumption as the output. Losses due to conveyance and evaporation were considered. Analysis of data for a case study was presented. Water qualities in storage were found to be acceptable for drinking. In rural and remote areas of developing countries where annual rainfall is about 1200 mm, an individual family could collect rain water from the house roof and store it in a tank to use for drinking during the dry season. The water quality was found to meet the international standard for drinking. However, it was found that the MPN index of coliform micro-organisms was high, but it was much lower than the water that people are taking from natural sources such as ponds and rivers. (See also W75-01428) (Humphreys-ISWS)
W75-01469

POLAR REGION SNOW STRATIGRAPHY TECHNIQUES APPLIED TO COMMERCIAL PROBLEMS,
Mitre Corp., Bedford, Mass.
For primary bibliographic entry see Field 2C.
W75-01525

ELEVATION AND METEOROLOGICAL CONTROLS ON THE DENSITY OF NEW SNOW,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2C.
W75-01538

3C. Use Of Water Of Impaired Quality

USE OF SEWAGE WASTEWATER AND SLUDGE IN REVEGETATING STRIP MINE SPOIL BANKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5E.
W75-01237

PROBLEMS IN TREATMENT OF WATER AND SOLUTIONS IN A HARDBOARD MILL (PROBLEMATICA DE TRATAMIENTO DE AGUA Y SOLUCIONES EN UNA PLANTA DE HARD BOARD),
Fibracel S.A. (Mexico).
For primary bibliographic entry see Field 5D.
W75-01288

3D. Conservation In Domestic and Municipal Use

STORM DRAINAGE SYSTEM DESIGN AND NEW CITY PLANNING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 8A.
W75-01253

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 6D.
W75-01254

3E. Conservation In Industry

WASTE FROM WASTEPAPER UTILIZATION,
National Council of Air and Stream Improvement, Boston, Mass.
For primary bibliographic entry see Field 5B.
W75-01261

POLLUTION: PANELS AND TROUT (POLLUTION: DES PANNEAUX ET DES TRUITES).
For primary bibliographic entry see Field 5D.
W75-01280

REDUCTION OF WATER CONSUMPTION IN THE MANUFACTURE OF BOXBOARD AND BAG PAPER (SOKRASHCHENIE VODOPOTREBLENIYA PRI PROIZVODSTVE TARNOGO KARTONA I MESHOCHNOI BUMAGI),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
R. A. Narymskaya, N. N. Churzina, and Ya. V. Nikitin.
Bumazhnaya Promyshlennost', No 5, p 10-12, May 1974. 2 tab, 1 fig, 5 ref.

Descriptors: *Industrial water, *Water conservation, *Recirculated water, *Water reuse, *Pulp and paper industry, *Water consumption(Except consumptive use), Recycling.
Identifiers: USSR, Boxboards, Bag papers, Wrapping papers, White water(Paper machine).

Soviet standards for the paper industry specify a freshwater consumption of 46 and 40 cu m/ton in the production of bag and wrapping papers and of boxboards, respectively. The actual water consumption at many Soviet mills was surveyed and found to be higher. Various methods for recycling of white water are outlined and illustrated, based on domestic and foreign mill experience. Installation of suitable systems should lower water consumption to ca. 29 cu m/ton or less. An actual installation at the Kekhra paper mill according to recommendations reduced water consumption to between 20 and 25 cu m/ton for a recycling coefficient of 0.9. Physical, chemical, and biological properties required of recirculated white water are tabulated. Similar recycling measures might be instituted in many existing mills without substantial capital investment or installation of additional water-purification facilities. (Stapinski-IPC)
W75-01285

DISPOSING OF INDUSTRIAL WASTES: THE PAPER INDUSTRY (SMALTIMENTO RIFIUTI INDUSTRIALI: INDUSTRIA DELLA CARTA),
Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy).
For primary bibliographic entry see Field 5D.
W75-01379

SURVEY OF PULP AND PAPER INDUSTRY ENVIRONMENTAL PROTECTION EXPENDITURES AND OPERATING COSTS -- 1973,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-01380

FIVE-DAY BOD GENERATED DURING BLEACHING OF PULP IN THE GEMER PULP AND PAPER MILL (MNOZSTVO BSK(5) PRI BIELENI PAPIERENSKEJ BUNICINY V GEMERSKEJ CELULOZKE A PAPIERNI),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W75-01381

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
For primary bibliographic entry see Field 4A.
W75-01430

3F. Conservation In Agriculture

DATA FOR BORDER IRRIGATION MODELS,
Arizona Univ., Tucson.
R. L. Roth, D. W. Fonken, D. D. Fangmeier, and K. T. Atchison.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 17, No 1, p 157-161, February, 1974. 1 fig, 7 tab, 6 ref.

Descriptors: *Border irrigation, *Model studies, Hydraulics, Simulation analysis, *Data collections, Measurement, Infiltration, Flow, Hydrographs, Soil moisture, Evaluation, Systems analysis.
Identifiers: *Field data, Model validity, Least squares regression, Water surface elevation, Bare soil surface.

Understanding the hydraulic variables in border irrigation is essential to improve border design and operation. Models are being developed which will be able to analyze a wider range of irrigation conditions and at a lower cost than field experiments. Before the models can be used, however, it is important that they be calibrated with accurate field data. Detailed results from seven irrigations on bare soil surface are presented. Border irrigations made on a precisely instrumented border provided an opportunity for reliable field measurements and computations of advance time, infiltration, flow depth, velocity, discharge, and roughness over space and time for constant inflow rates at a fixed slope on a bare soil surface. Estimates of recession times were also obtained. The data can be used to validate mathematical models simulating border irrigations. Because of the tremendous amount of labor and time involved in collecting accurate field data, it is economical to simulate irrigations by using such models. (Bell-Cornell)
W75-01120

ROLE OF PHYSIOLOGICAL PLANT ACTIVITY IN ADAPTIVE INCREASE IN DROUGHT RESISTANCE: 1. EFFECT OF HEAT REGIMES ON MOISTENED GERMINATING WHEAT SEEDS, (IN RUSSIAN),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
L. A. Ignatev.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 5. p 43-51, 1973, Illus. English summary.

Descriptors: *Drought resistance, Plant physiology, Seeds, Germination, *Wheat, Respiration.

Conditions favoring the adaptation of spring wheat (cv. 'Lutescens 758') to elevated temperatures were studied by means of presowing heat treatment on the seeds. The following regimes were tested: (01) a gradual increase of temperature (30 deg to 70 deg x 8 h) and decrease of seed moisture from 38-40% to 15-16%, (02) stepped increase of heat on seeds with constant moisture content (38-40%) 47 deg x 2.5 h + 25 deg x 3.0 h + 47 deg x 3.0 h + 25 deg x 4.0 h + 47 deg x 3.5 h + 25 deg x 5.0 h + 47 deg x 4.0 h. According to the total physiological activity and heat resistance of the plants (protoplasm permeability and cell water-holding capacity, thermal stability of respiration, dynamics of dry matter accumulation and productivity) the comparative estimation at tillering and shooting stages indicated the advantage of seed heating under regime (02).--Copyright 1974, Biological Abstracts, Inc.
W75-01150

PHOSPHORUS COMPOUNDS IN CORN TISSUES UNDER UNFAVORABLE CONDITIONS OF MOISTENING, (IN RUSSIAN),
Kazan Agricultural Inst. (USSR).
F. D. Samuilov, and L. A. Lebedeva.
Fiziol Biokhim Kul't Rast. Vol 5, No 3, p 247-251. 1973, English summary.

Descriptors: *Phosphorus compounds, *Corn(Field), Plant tissues, Drought, Soil moisture.

The content of P compounds was studied in maize leaves and roots during drought and flooding. The content of organic P compounds taking part in the energy metabolism changed in 2 stages under unfavorable conditions. Changes in P metabolism under conditions of moderate drought and short-term flood may provide evidence for a temporary activation of metabolic processes. Under conditions of severe drought and prolonged flooding nucleotide phosphates and phosphoric ethers of sugars affecting the energetic metabolism of plants is sharply reduced.--Copyright 1974, Biological Abstracts, Inc.
W75-01151

MINERAL AND CHEMICAL COMPOSITION OF FINE-DISPERSED FRACTIONS OF THE DESERTED ANCIENT IRRIGATION SOILS IN MURGAB OASIS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2G.
W75-01154

FUNCTIONAL ACTIVITY OF RIBOSOMES IN WHEAT AND BEAN PLANTS HARDENED AGAINST DROUGHT, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
N. A. Satarova, E. K. Tvorus, and S. I. Bezgina.
S-Kh Biol. Vol 8, No 3, p 395-400, 1973, Illus, English summary.

Descriptors: *Drought resistance, *Wheat, *Bean, Proteins, Drought.
Identifiers: *Ribosomes.

The functional activity of wheat and bean plants after the pre-sowing hardening against drought was studied with the use of C14 amino acids. The pre-sowing hardening stimulated the functional activity of ribosomes isolated from watered, partially dehydrated leaves and leaves which had restored their turgor which could be probably explained by the high resistance of the protein-synthesizing system due to the comparatively decreased activity of ribonuclease. The preservation of the ability to synthesize proteins in hardened plants after their partial dehydration and the stimulations of synthesis in leaves which had restored their turgor conditioned the higher efficiency of reparation processes in them.--Copyright 1974, Biological Abstracts, Inc.
W75-01156

WATER NEEDS OF FLORIDA CITRUS,
Florida Univ., Gainesville. Committee on Water Needs for Citrus.
J. F. Gerber, A. H. Krezdorn, J. F. Bartholic, J. R. Conner, and H. J. Reitz.
Proceedings of the Florida State Horticultural Society, Vol 86, November 1973, p 61-64. 2 fig, 1 tab, 7 ref. OWRT B-014-FLA(2). 14-31-0001-3868.

Descriptors: *Evapotranspiration, Evapotranspiration control, Energy budget, *Water balance, *Florida, *Citrus fruits, *Water requirements, Irrigation practices, Recharge, Methodology.

A method was developed which gives quantitative information on water needs for Florida Citrus. The citrus growing region of the state was divided into 8 areas and citrus water needs in each area were determined by 2-week periods. Water required by groves, irrigation methods and efficiencies were considered in determining total water needs. Estimates were made of future water requirements. Water balance calculations show that citrus is presently a net contributor of water to ground water recharge. With continued expansion of irrigated acreage, however, this balance could be significantly reduced. (Morgan-Florida)
W75-01222

MEASURE OF WATER STRESS IN CITRUS,
Florida Univ., Gainesville. Dept. of Fruit Crops.
W. D. Bell, J. F. Bartholic, and M. Cohen.
Proceedings of the Florida State Horticultural Society, Vol 86, November 1973, p 71-75. 3 fig, 3 tab, 3 ref. OWRT B-014-FLA(3). 14-31-0001-3868.

Descriptors: *Evapotranspiration, Evapotranspiration control, Energy budget, Water balance, *Florida, *Citrus fruits, Measurement.
Identifiers: *Pressure bomb measurement, *Tangelos trees, *Water stress.

The Scholander pressure bomb was successfully used to measure water stress of 'Orlando' tangelo trees growing on different stocks. The water stress appeared to be dependent on the stock used. 'Orlando' tangelos growing on sour orange were under a greater water stress than those on sweet lime. Leaves of trees with citrus blight and 'young tree decline' (YTD) were under a greater water stress than leaves from healthy trees. (Morgan-Florida)
W75-01223

LOSSES OF NUTRIENTS IN DRAINAGE WATER FROM A MATURE PEACH ORCHARD,
Florida Univ., Gainesville. Dept. of Fruit Crops.
H. T. Phung, J. F. Bartholic, and D. W. Buchanan.
Proceedings of the Florida State Horticultural Society, Vol 86, November 1973, p 317-321. 3 fig, 1 tab, 8 ref. OWRT B-014-FLA(4). 14-31-0001-3868.

Descriptors: *Evapotranspiration, Evapotranspiration control, Energy budget, Water balance, *Florida, Citrus fruits, *Nutrients, *Drainage water, *Peaches, Orchards, Sands, Fertilizers.
Identifiers: *Kanapaha fine sands.

Nutrient losses in drainage water were measured from a 9-acre peach and nectarine orchard growing on a Kanapaha fine sand during the 1973 season. Fertilizer (10-0-10) was applied at 300 lb/acre during the bloom and fruiting stages (March-June) and again after harvesting (July-August). Results from January through June showed that no differences occurred in total leaching losses between single and split applications. Concentrations of nutrients were generally low and were not affected appreciably by fertilization and rainfall. Monthly leaching losses in the drainage water, however, were profoundly influenced by rainfall duration and intensity. In the first 6 months, approximately 10.5 lb NO3--N, 0.5 lb P, 2.6 lb K, 20.6 lb Ca in a total of 151 lb soluble salts per acre were lost in drainage water. Leaching losses of micronutrients were insignificant. (Morgan-Florida)
W75-01224

METHODS FOR ANALYSIS OF IRRIGATED SOILS.
Commonwealth Agricultural Bureaux Slough (England); and Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).
For primary bibliographic entry see Field 2G.
W75-01239

FRUITFULNESS IN GRAPE-VINES: EFFECTS OF WATER STRESS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
M. S. Buttrose.
Vitis Vol 12, p 299 - 305, 1974 6 fig, 3 tab, 6 ref.

Descriptors: *Vine crops, *Crop response, *Moisture stress, *Moisture uptake, *Growth rate, Crop production, Soil-water-plant relationships, Water requirements, Plant physiology, Irrigation effects, Moisture availability, Crops.
Identifiers: *Grapevines, Bud development.

Plants of grape variety Cabernet Sauvignon were grown in undrained containers in a glasshouse and watering was controlled by weighing. There were three treatments with water contents of the growing medium falling either to 60% (A), 40%(B) or 20%(C) of field capacity before re-watering. As water stress increased the amount of water used decreased as did extension growth of shoots. At harvest 13 weeks after bud burst the weight of (C) plants was less than two thirds that of (A) plants. Fruitfulness (number and weight of bunch primordia per bud) was progressively depressed with increase in water stress. Number and weight of leaf primordia in buds were unaffected. (CSIRO)
W75-01242

USE OF PHOSPHORIC AND SULFURIC ACIDS TO REDUCE SOIL CRUSTING AND IMPROVE EMERGENCE OF SUGARBEET (BETA VULGARIS L.) SEEDLINGS,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
B. B. Wudiri.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 498, $4.75 in paper copy, $2.25 in microfiche. Master's Thesis, April, 1973. 83 p, 12 fig, 13 tab, 43 ref. OWRR-A-034-ARIZ(1). 14-31-0001-3803.

Descriptors: Soil physical properties, *Sugar beets, *Soil amendments, Soil chemical properties, Irrigation efficiency, *Calcareous soils, Loam, Clays, Salts.
Identifiers: Sulfuric acid, Phosphoric acid, Soil crusting, Seedling emergence.

Soil crusting is often a serious problem in establishing adequate and uniform stands of small seeded crops like sugarbeet (Beta vulgaris L.). Small plots and on-farm experiments were established to determine the effectiveness of sulfuric and phosphoric acids as surface-applied soil amendments to reduce soil crusting and improve sugarbeet seedling emergence. Several rates of sulfuric (95%) and phosphoric (24%) acid were applied to silty clay-loam calcareous soil in 6 cm bands over rows seeded to sugarbeets. The research was conducted in two laboratory and six on-farm test experiments. Temperature and moisture of the soil and air were monitored and seedling counts were made. Additionally, plants were analyzed for phosphorus and seed zone salinity and pH evaluations were made. Application of 329 to 1,314 l of phosphoric acid per ha reduced crusting, significantly increased seedling emergence, and significantly increased phosphorus content of beet seedlings. Although the application of 188 to 563 l of sulfuric acid reduced crusting, it also reduced seedling emergence. High concentration of soluble salts in soils treated with the sulfuric acid increased salinity in the seed zone, thereby inhibiting seedling emergence.
W75-01386

ENVIRONMENTAL PLANNING OF AN IRRIGATION PROJECT IN A DEVELOPING COUNTRY,
Kerala Public Works Dept., Trivandrum (India).
K. Bharathan.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 181-186.

Descriptors: *Water resources, *Water resources development, *Planning, Irrigation, Salinity, Reservoir silting, Regime, Rivers, Ecology, Project planning, Environmental effects, Sedimentation.
Identifiers: *Developing countries, Rehabilitation of displaced persons.

In a developing country like India where the water resources developed for irrigation are much less than the minimum requirement, a large number of irrigation schemes have to be considered. Problems associated with planning irrigation projects were discussed. These problems include rehabilitation of displaced persons, sedimentation in reservoirs, water logging, salinity, and maintenance of river regimes. Ecological considerations are very important, but this aspect cannot be given so much importance as is given in developed countries. Most of the ill effects, consequent to the construction of an irrigation project, can be avoided by careful planning and the dam, reservoir, and canals can be made attractive with little extra cost. (See also W75-01428) (Humpreys-ISWS)
W75-01444

FUNCTION AND WORK OF FAO IN THE FIELD OF INTERNATIONAL COOPERATION IN DEVELOPMENT OF WATER RESOURCES FOR PRESERVATION OF THE HUMAN ENVIRONMENT,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
H. M. Horning.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, Septmeber 24-28, 1973. International Water Resources Assoication, Champaign, Illinois, p 205-215. 14 ref.

Descriptors: *United Nations, *Organizations, *Water resources development, *Environment,

*Planning, Programs, Foreign countries, Coordination, Water management(Applied), Water resources, Rural areas, Water conservation.
Identifiers: *International cooperation, *Food and Agriculture Organization, Human environment.

The danger of a possible food crisis remains the essential consideration for agricultural development policies. Consequently, water resources development will play an increasingly important role in safeguarding food producting. The FAO program of international co-operation in the water field was described. FAO's approach to water resources development is concerned with the harmonization of water resources, their development and use with: (1) development and use of other natural resources that are essential for rural development; (2) environmental impact of agriculture and forestry; (3) conservation of natural resources and the requirements of their rational use; (4) use of agricultural inputs for optimum production; (5) complementary water uses for large scale development of predominantly rural areas; (6) requirements of the social and economic development of rural areas; (7) betterment of rural life; and (8) contribution that agriculture and forestry can make toward waste water disposal. Emphasis in the water field lies on developmental aid to member countries through international co-operation in water resources development. The work program includes: assessment of land and water resources and need; surveys and planning of soil and water resources; water development; water application, management, and use; land reclamation; organization and management of land and water development schemes; water conservation; and research and training for management of land and water resources. (See also W75-01428) (Humphreys-ISWS)
W75-01447

EVAPOTRANSPIRATION OF WHEAT, OATS AND BARLEY,
Ministry of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 2D.
W75-01493

MULTIRESIDUE METHOD FOR THE DETERMINATION OF TRIAZINE HERBICIDES IN FIELD-GROWN AGRICULTURAL CROPS, WATER, AND SOILS,
CIBA-GEIGY Ltd., Basel (Switzerland). Agrochemical Div.
For primary bibliographic entry see Field 5A.
W75-01503

EFFECT OF WETTING DURATION AND OF OTHER ENVIRONMENTAL FACTORS ON THE DEVELOPMENT OF STEMPHYLIUM BOTRYOSUM F. SP. LYCOPERSICI IN TOMATOES,
Bar-Ilan Univ., Ramat-Gan (Israel). Dept. of Life Sciences.
E. Bashi, J. Rotem, and J. Putter.
Phytoparasitica, Vol 1, No 2, p 87-94, 1973, Illus.
Identifiers: Lycopersicon-esculentum, Pattern, Seasonal, Spore, *Stemphylium-botryosum-f-sp-lycopersi, *Temperature, *Tomatoes, Wetting, *Israel, *Blight.

On inoculated tomato (Lycopersicon esculentum Mill.) leaves infection was relatively insensitive to temperature between 15 and the 25C optimum. Wetting duration had a greater effect on infection than temperature or spore load, and also influenced the extent of the effect of these 2 factors. The optimum temperature for leaf colonization was 25C; it was more sharply defined under constant temperature than when alternating with a night temperature of 10C. At 39C, colonization was inhibited only by exposure longer than 12 h. The results explain the seasonal pattern of blight in Israel.--Copyright 1974, Biological Abstracts, Inc.
W75-01605

EPIDEMIOLOGICAL LIMITATIONS TO THE FORECASTING OF DOWNY MILDEWS AND LATE BLIGHT IN ISRAEL,
Ministry of Agriculture, Tel-Aviv (Israel). Dept. of Plant Protection.
J. Palti, and J. Rotem.
Phytoparasitica, Vol 1, No 2, p 119-126, 1973.
Identifiers: *Epidemiological studies, *Blight, *Forecasting, Humidity, Irrigation, *Israel, *Mildews, Temperature, Weather.

Agricultural practices such as irrigation and year-round cultivation of crops, render semi-arid areas much more suitable for development of downy mildews and late blight than might be supposed by weather criteria alone. These diseases can develop even under favorable humidity conditions, due to a favorable microclimate and abundant pathogen reproduction. However, the complex interrelations and shifting significance to be attributed to factors affecting disease development make their regional forecasting in semi-arid areas impracticable. This is due to the absence of a clear-cut 'zero-time' for the beginning of the disease development, the limited significance of the temperature factor, the unpredictable occurance of hot and dry spells, the characteristics of short, intense subtropical rainfall, and the dominance of microclimatic factors. On the other hand, timing of control operations can be aided by regional determination of disease-free periods in crops sown in different seasons and by prediction of the length of such periods in individual fields according to their age and density, irrigation regime and proximity to sources of inoculum.--Copyright 1974, Biological Abstracts, Inc.
W75-01606

SOUTHERN CORN LEAF BLIGHT DEVELOPMENT RELATIVE TO TEMPERATURE, MOISTURE AND FUNGICIDE APPLICATIONS,
Florida Univ., Gainesville.
N. C. Schenck, and T. J. Stelter.
Phytopathology, Vol 64, No 5, p 619-624, 1974, Illus.
Identifiers: *Blight, *Corn leaf blight, *Fungicides, Helminthosporium-maydis, *Florida, Mancozeb, *Moisture, *Temperature.

Southern corn leaf blight (SCLB) (Helminthosporium maydis) became severe on field corn (Zea mays) at Gainesville and Lakeland, Florida, when minimum temperatures were 20C or above and relative humidity (RH) was 100% for 6 h or more on several consecutive nights. These parameters for severe SCLB development in the field agree with results of others and indicate warm, moist weather favors SCLB epidemics. SCLB severity and rate of development were greater on Texas male-sterile than on normal cytoplasm hybrids, indicating that race T of the pathogen was predominant. SCLB became moderately severe on nonsprayed plants 12-14 days earlier than on plants sprayed weekly beginning at or before tasseling. Mancozeb at 1.7 kg/ha effectively controlled SCLB when applied by airplane in 28.0 or 23.41 of water/ha or when applied with ground equipment in 9351 of water/ha. Yields from plants with effective disease control were consistently better than nonsprayed plants, but yields were not statistically correlated with disease incidence.--Copyright 1974, Biological Abstracts, Inc.
W75-01607

EFFECT OF TEMPERATURE AND MOISTURE ON CRISTULARIELLA PYRAMIDALIS,
Auburn Univ., Ala. Dept. of Botany and Microbiology.
A. J. Latham.
Phytopathology, Vol 64, No 5, p 635-639, 1974, Illus.
Identifiers: *Cristulariella-pyramidalis, Humidity, *Moisture, *Pecan leaves, *Sporophore production, *Temperature.

Development of C. pyramidalis from sporophores on agar and pecan leaves was similar at various temperatures. Lesions caused by C. pyramidalis on pecan leaves increased in size from 6C through 27C, with maximal development at 21C. Sphrophores formed on lesions at 9C through 24C with maximal production at 21C. Maximal sporophore production occurred on wet leaves. Low levels of sporophore production occurred at 96 plus or minus 2% relative humidity (RH). Below 94% (RH). Below 94% RH, peripheral development from established lesions did not occur after 24 h nor were sporphores produced. C. pyramidalis remained viable in 60-day-old lesions on pecan leaves produced sporophores after being moist 96 h.--Copyright 1974, Biological Abstracts, Inc.
W75-01608

THE DEVELOPMENT OF HYPOXYLON CANKER OF POPULUS TREMULOIDES: ROLE OF INTERACTING ENVIRONMENTAL FACTORS,
Wisconsin Univ., Madison. Dept. of Plant Pathology.
D. K. Bagga, and E. B. Smalley.
Patopathology, Vol 64, No 5, p 658-662, 1974, Illus.
Identifiers: *Canker development, Environmental studies, Humidity, *Hypoxylon pruinatum, *Moisture stress, *Populus tremuloides, Soils, *Pathogens.

Any factor which contributed to host-moisture stress increased susceptibility to the pathogen (Hypoxylon pruinatum (Klot.) Cke.). Air relative humidities (RH) higher than 50% were not favorable for canker development occurred in plants subjected to combinations of low RH and water stress. Disease development was poorest on plants grown in soils with high water-holding capacities. Nonfertilized plants were more susceptible than plants fertilized regularly.--Copyright 1974, Biological Abstracts, Inc.
W75-01609

EPIDEMIOLOGICAL PATTERNS OF PHYTOPHTHORA INFESTANS UNDER SEMI-ARID CONDITIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Div. of Plant Pathology.
J. Rotem, and Y. Cohen.
Phytopathology, Vol 64, No 5, p 717-714, 1974, Illus.
Identifiers: Arid lands, Epidemiological studies, Humidity, Phytophthora-infestans, Solanum-tuberosum, Temperature, Semi-arid conditions, *Potato blight, *Blight.

Epidemic patterns of potato (Solanum tuberosum) late blight (Phytophthora infestans) during a period of heavy nocturnal dew followed by hot and dry days, were studied by inducing epidemics in growth chambers and assessing the influence of environmental factors on epidemic development. In all but the hottest regimes of temp (temperature), epidemics were enhanced by low daytime relative humidity (RH). The chief factor facilitating epidemic development was abundant sporangial dispersal enhanced by low RH. However, in days with high temp the survivability of dispersed sporangia was reduced; more under low, than under high, conditions of humidity. In such instances, survivability overrides dispersal effect and becomes a major factor in epidemic development. Under extremely unfavorable (but transient) conditions of temp and humidity, the high survivability of mycelium in leaves, and especially in stem lesions, provided the opportunity for subsequent renewal of an epidemic.--Copyright 1974, Biological Abstracts, Inc.
W75-01610

BASIDIOCARP DEVELOPMENT AND SPORE RELEASE BY STEREUM PURPUREUM IN THE FIELD,
Department of Scientific and Industrial Research, Auckland (New Zealand). Plant Disease Div.
M. H. Dye.
N Z J Agric Res, Vol 17, No 1, p 93-100, 1974, Illus.
Identifiers: *Basidiocarp, Climatic conditions, Humidity, Rain, *Spore traps, Stereum-purpureum, *Sporophores, *Apple trees, Orchards.

A Hirst spore trap was operated for 1 yr in the center of a dying apple tree bearing numerous basidiocarps (sporophores) of S. purpureum. Sporophores were produced mainly in autumn and winter on dead branches which were alive the previous spring and summer; they did not develop while branches were still leafing, or on old dead branches. Once produced, individual sporophores shed spores during suitable weather for at least 8 mo. The main climatic factor associated with spore release was rain. Spores were released when the relative humidity rose above approximately 90% after rain, and fell below this level; they were not shed after dew. Significant numbers of spores were caught on 90.6% of the days when rain fell, and on 62.2% of the days the trap was operated. Spores were shed during the day and at night, although more frequently at night. There was little difference in the number of rain and spore-release days in the different seasons. Duration of continuous spore showers ranged from <1 to 29 h.--Copyright 1974, Biological Abstracts, Inc.
W75-01611

INFLUENCE OF RESTRICTED WATER SUPPLY ON BLOSSOM-END ROT AND IONIC COMPOSITION OF TOMATOES GROWN IN NUTRIENT SOLUTION,
Institute for Soil Fertility, Groningen (Netherlands).
B. J. Van Goor.
Commun Soil Sci Plant Anal, Vol 5, No 1, p 13-24, 1974, Illus.
Identifiers: Blossoms, *Calcium, Glycols, Ionic, Nutrient solutions, Osmotic stress, *Rot, *Tomatoes, Water supply.

The occurrence of blossom-end rot of tomatoes is correlated with a low Ca content. The disease incidence can be aggravated by water stress. An attempt was made to study the effects of water stress under conditions of equal concentration of ions by addition of polyethylene glycol in water culture. These treatments gave a higher indicence of blossom-end rot and withering of the plant tops. Although direct effects of water stress on blossom-end rot cannot be excluded a restricted uptake of most ions was demonstrated, Mg excepted. Calculation of the indexes (K + Mg)/Ca for uptake and for the leaf show that under influence of osmotic stress the relative Ca content is lowered.--Copyright 1974, Biological Abstracts, Inc.
W75-01612

EFFECT OF MOISTURE CONTENT ON ANTIBIOTIC ACTIVITY OF PLANTS, (IN BELRUSSIAN),
Akademiya Navuk BSSR, Minsk. Tsentralny Botanichny Sad.
S. U. Harlyenka.
Vyestsi Akad Navuk B Ssr Syer Biyal Navuk, Vol 6, p 24-28, 1973, Russian summary.
Identifiers: *Antibiotic activity(Plants), Fusarium-oxysporu, Fusicladium-pirinum, *Moisture, *Plant diseases, *Pears, *Asters, *Phytoncides.

Experimental data on the effect of soil moisture content on antibiotic activity of pears and asters are presented. A physiological depression in the development of the plants caused by a moisture deficinecy is generally accompanied by a decrease of the production of phytoncides, which in turn leads to a decrease of the resistance of the plants to diseases (Fusicladium pirinum and Fusarium oxysporum).--Copyright 1974, Biological Abstracts, Inc.
W75-01613

DIFFERENT SENSITIVITY OF PHOTOSYNTHESIS AND TRANSPIRATION TO SOME HERBICIDES AND TRANSPIRATION INHIBITORS,
Agricultural Univ., Wageningen (Netherlands). Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen.
J. L. P. Van Oorschot.
Acta Bot Neerl, Vol 23, No 1, p 36-41, 1974, Illus.
Identifiers: Acetic acid, Beans, Foliage, *Herbicides, Inhibitors, Ioxynil, Isocil, Nutrient, Osmotic pressure, Phenols, *Photosynthesis, Roots, Simeton, Succinic acid, Sugar beets, Transpiration inhibitors, *Transpiration.

Rates of transpiration and net photosynthesis in intact sugar beet and bean plants were measured during 14 h exposure to some herbicides, to transpiration inhibitors, and to high osmotic pressure. Transpiration and photosynthesis were inhibited to the same extent of transpiration slightly stronger, by treatment of the roots with ioxynil, by application of PMA (phenyl mercuric acetic acid) and DAS (n-2-decenylsuccinic acid) either to the rooting medium or to the foliage, and by high osmotic stress. Photosynthesis was inhibited to a greater degree than transpiration by simeton and isocil applied both to the roots and the leaves, and by a foliar spray of ioxynil. Similar, but somewhat smaller differences were found when DNOC (2-methyl-4,6-dinitrophenol) was applied to the nutrient solution or to the leaves.--Copyright 1974, Biological Abstracts, Inc.
W75-01615

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A CASE STUDY OF THE LOCAL ECONOMIC IMPACT OF RESERVOIR RECREATION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
For primary bibliographic entry see Field 6B.
W75-01106

A PROCESS FOR FEDERAL WATER PLANNING AT THE FIELD LEVEL,
Stanford Univ, Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W75-01115

THE ANCLOTE AND PITHLACHASCOTEE RIVERS AS WATER-SUPPLY SOURCES,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-01164

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF MISSOURI FLOODS,
Geological Survey, Rolla, Mo.
L. D. Hauth.
Open-file report, 1974. 20 p, 7 fig, 2 tab, 9 ref.

Descriptors: *Floods, *Missouri, *Flood frequency, *Peak discharge, Regression analysis, Flood recurrence interval, Estimating, Drainage area, Slopes.

A technique is presented for estimating the magnitude and frequency of Missouri floods. For 152 gaged sites the magnitudes of floods having recurrence intervals of 2 to 100 years are provided in tables. For ungaged sites, regression relations are presented that allow the estimation of flood magnitudes from a knowledge of the upstream drainage area and the average main-channel slope. The estimating equations are provided in a graphical form for the convenience of the user. (Knapp-USGS)
W75-01171

WATER IN THE METHOW RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
K. L. Walters, and E. G. Nassar.
Washington State Department of Ecology, Olympia, Water-Supply Bulletin 38, 1974. 73 p, 18 fig, 13 tab, 13 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Washington, Water yield, Water utilization, Data collections, Hydrologic data, Streamflow, Water wells.
Identifiers: *Methow River basin(Wash).

The amount of water available, the quality or usability of the water, and the frequency of seasonal water shortages and surpluses are defined in the Methow River basin, Washington. This report is the result of the collection, summarization, and interpretation of the readily available water information on the basin, for use in developing, protecting, and managing the area's water resources. Supplies of fresh surface water and groundwater will continue to be adequate for presently projected use in the Methow River basin for many years to come. The basin contains many perennial streams that empty into the Methow River, and the broader, more populated parts of the valley floors are underlain in most places by unconsolidated sand and gravel which contain groundwater in quantity sufficient for domestic and supplemental irrigation use. By far, irrigation is the principal water use in the Methow valley. About 95 percent of the irrigation water comes from streams and the remaining 5 percent comes from groundwater. Some irrigators are turning to groundwater irrigation because of the inadequacy of the surface-water conveyance system. In some areas, such as the Beaver Creek basin, most of the streamflow during the period June-September is being diverted for irrigation. The Methow River valley is adversely effected by extreme flooding and by the prevalence of subfreezing temperatures in winter. Water generally is suitable for most common uses including drinking, according to standards recommended by the U. S. Public Health Service. (Knapp-USGS)
W75-01181

DRAINAGE AREAS OF STREAMS IN ARKANSAS, WHITE RIVER BASIN,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 2E.
W75-01183

DRAINAGE SYSTEM,
For primary bibliographic entry see Field 8B.
W75-01188

MODELING AND OPTIMIZATION OF WATER RESOURCES SYSTEMS --- PHASE III, STOCHASTIC MODELING AND OPTIMIZATION OF THE WALNUT AND POTEAU RIVER BASINS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. S. Lee.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 459, $9.50 in paper copy, $2.25 in microfiche. Completion report, (1974), 331 p, 62 fig, 73 tab, 248 ref, 3 append. OWRT C-3051(No. 3678)(2).

Descriptors: *Model studies, *Dynamic programming, *Kansas, *Markov processes, Management, *Optimization, *Planning, *Flood control, Reservoirs, *Oklahoma, Stochastic processes, Conservation, Recreation, Analytical techniques, Water resources development, Probability, Economics, Water supply, Irrigation, Competing uses, *Multiple-purpose reservoirs, Cost-benefit analysis, Optimum development plans.
Identifiers: Walnut River Basin(Kan), Poteau River Basin(Okla), Gradient projection technique, Markovian decision.

This work involves finding the best initial design and the optimal operating policy over the life of multiple reservoir systems with multiple purposes, so that the flood and various water usage benefits less the various capital and operating costs are optimized. All the benefit and cost functions are correlated into polynomials from actual operating data. The reservoir is divided into three imaging water storage pools: sedimentation, conservation, and flood control pools. The stochastic optimization techniques used are stochastic dynamic programming, generalized reduced gradient technique combined with Markovian decision, gradient projection technique combined with Markovian decision, and stochastic maximum principle.
W75-01210

COMPUTER MEMORY REQUIREMENTS FOR DP AND DDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
D. Maidment, V. T. Chow, and G. W. Tauxe.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 440, $3.25 in paper copy, $2.25 in microfiche. Presented at AGU 55th Annual Meeting, April 8-12, Washington, D.C. 1974, 13 p, 4 fig, 2 tab, 9 ref. OWRT B-060-ILL(6). 14-31-0001-3579.

Descriptors: *Optimization, *System analysis, Management, Costs comparisons, *Dynamic programming, Computers, *Reservoir operation, *Multiple-purpose reservoirs, Design, Aqueducts.
Identifiers: *Computer memory requirements, Code memory, Data memory, Cost trade-offs.

The computer memory required for a water resources optimization problem by dynamic programming (DP) or discrete differential dynamic programming (DDDP) may be considered as the sum of the machine memory which is relatively constant, the code memory which increases slowly with the problem size, and the data memory which increases rapidly with the problem size. The cost trade-offs involved in replacing core memory by slow speed memory (disks or tapes) are investigated. The proposed formulas are verified by examples of water resources systems analysis for optimization of operation of single- and multiple-purpose reservoir networks and of storm sewer system design and aqueducts.
W75-01212

COMPUTER TIME REQUIREMENTS FOR DP AND DDDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow, D. R. Maidment, and G. W. Tauxe.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 441, $3.25 in paper copy, $2.25 in microfiche. Presented at AGU 55th Annual Meeting, April 8-12, 1974 Washington, D.C. 17 p, 4 fig, 1 tab, 15 ref. OWRT B-060-ILL(7). 14-31-0001-3579.

Descriptors: Water resources, *Reservoir operation, *Optimization, *Systems analysis, Management computers, *Storm drains, *Dynamic programming, *Multiple-purpose reservoirs, Design, Aqueducts.
Identifiers: *Computer time requirements.

The computer time required for a water resources optimization problem by dynamic programming (DP) or discrete differential dynamic programming (DDDP) may be considered as the sum of the compiling time for programming language translation, the initiating time for the program, and the execution time. The execution time is the dominant component of the total computer time and an equation has been formulated. The value of the time for one unit operation depends on type of computer, method of coding, kind of compiler, nature of constraints, and other factors. The computers used in the determination of the time for one unit operation include: IBM 360/50, IBM 360/75, IBM 360/91 and Burroughs B-6700. The problems verifying the formulas include operations of single- and multiple-purpose reservoir networks and optimal design of storm sewer systems and aqueducts.
W75-01213

RADIOTELEMETRY OF HYDROMETEROLOGICAL DATA,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W75-01214

SIMULATIONS OF WATERSHED HYDROLOGY ON AGRICULTURAL WATERSHEDS IN VIRGINIA WITH THE STANFORD MODEL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-01218

WAMIS--AN AID IN LOCATING INFORMATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 10A.
W75-01219

SUBSURFACE DRAINAGE SOLUTIONS BY GALERKIN'S METHOD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W75-01221

ISOLATES OF PENICILLIUM, ASPERGILLUS, AND TRICHODERMA TOXIC TO AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5C.
W75-01225

MULTIRESERVOIR OPTIMIZATION MODEL,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
J. S. Windsor, and V. T. Chow.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, HY 10, Proc Paper 9304, October, 1972, p 1827-1845. 5 fig, 7 ref. OWRT B-030(9) and B-060-ILL(5). 14-31-0001-1899/3579.

Descriptors: *Flood control, *Hydraulics, *Hydroelectric power, *Irrigation, Linear programming, *Low flow augmentation, Mathematical models, *Multiple purpose reservoirs, *Optimization, Planning, *Recreation, River basins, Water resources.

The analysis of river basin developments is viewed as a multilevel optimization problem. Mixed integer programming is coupled with historical, or stochastically generated, streamflow sequences to derive the optimal design for a complex river basin development. In formulating the model, emphasis is placed on the interrelationships which exist between the various components of the system and the coordination and integration of these components into a single economic unit. The model is designed to determine simultaneously the optimal set and sizes of reservoirs in the system, the optimal target outputs for the tangible water uses, power and irrigation, and the optimal operating procedure for attaining these outputs subject to the technological constraints. Intangible water uses, such as recreation and water quality control, are treated as optional constraints and their imputed values are obtained by a multiple solution technique. Part of the input to this model is provided by the irrigation submodel developed in a previous study.
W75-01226

ESTIMATION OF AGRICULTURE-FORESTRY TRANSITION MATRICES FROM AERIAL PHOTOGRAPHS,
North Carolina State Univ., Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4C.
W75-01231

PERSISTENCE OF HIGH DAILY DEMANDS IN AUSTRALIAN WATER SUPPLY SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-01246

STORM DRAINAGE SYSTEM DESIGN AND NEW CITY PLANNING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 8A.
W75-01253

FLOOD ESTIMATION IN EASTERN NEW SOUTH WALES - A DESIGN METHOD,
New South Wales Univ., Kensington, (Australia). School of Civil Engineering.
I. Cordery, and S. N. Webb.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 87-93, 1974. 6 fig, 12 tab, 12 ref.

Descriptors: *Design flood, *Unit hydrographs, *Small watersheds, *Flood peak, Watersheds(Basins), Design flow, Rainfall-runoff relationships, Water loss, Excessive precipitation, Gradients(Streams), River flow, Analytical techniques, *Australia.
Identifiers: *New South Wales.

A procedure is outlined for deriving design floods on small ungauged catchments east of the Great Dividing Range and north of latitude 35 degrees S in New South Wales. The fundamental assumption is that the peak flood discharge has the same return period as the design rainfall depth if median values of all the other significant variables are used in the design model. Two parameters are derived from readily measurable catchment characteristics representing the length and slope of the main stream. The derived parameters are interpolated in tables provided to give a standard synthetic unit hydrograph shape. This is then converted to a unit hydrograph and convolved with the rainfall excess to produce the design flood. In tests on 21 catchments, 16 of which were not used in deriving the procedure, about 75% of the estimated flood peaks were within the range of 0.67 to 1.5 times the corresponding peak estimated from a frequency analysis of observed floods. (CSIRO)
W75-01256

WATER AND WASTE FLOW MEASUREMENT,
Fischer and Porter Co., Warminster, Pa.
For primary bibliographic entry see Field 7B.
W75-01262

A STREAM TRACER STUDY USING LITHIUM AS THE TRACER,
Sonoco Products Co., Hartsville, S.C.
For primary bibliographic entry see Field 5B.
W75-01263

FLOOD HAZARDS IN VERMONT (A STRATEGY FOR ABATEMENT),
Vermont Dept. of Water Resources, Montpelier. Agency of Environmental Conservation.
R. J. Wernecke, and M. J. Mueller.
January, 1972, 39 p, 12 fig, 18 plate, 3 tab, 41 ref.

Descriptors: *Flood control, *Flood plains, *Vermont, Flood damage, Management, Flood plain insurance, Historic floods, Flood protection.

The past and present flood situation in Vermont is analyzed. Preventive and corrective measures in floodplain management are reviewed. A program is outlined for the state to use in developing sound floodplain management. Charts, figures and tables are utilized to describe the problem of flood hazards. Floodplain delineation, state legislation and policy, floodplain regulation, and insurance are stressed in the development of flood damage abatement.
W75-01290

SIMPLE NONLINEAR MODEL FOR FLOOD ESTIMATION,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
R. G. Mein, E. M. Laurenson, and T. A. McMahon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY11, Proceedings paper 10933, p 1507-1518, November 1974. 9 fig, 7 ref, 2 append.

Descriptors: *Floods, *Hydrographs, *Mathematical models, *Australia, Watersheds(Basins), Design flood, Hydraulics, Estimating, Hydrograph analysis.
Identifiers: Nonlinear systems, Victoria(Aust).

A simple nonlinear model was described that has several advantages over the traditional unit hydrograph technique. The catchment is divided into several subcatchments, the storage characteristics of which are represented by conceptual stores of S equal to kQ to the m power. The value of the exponent, m, was found to be reasonably constant in practice. The model was applied to two catchments in Victoria, Australia, and found to perform well. The chief advantages of such a model are that it allows catchment and rainfall variability to be modeled, and that it easily accommodates the case where gaging stations are remote from proposed dam sites. (Dawes-ISWS)
W75-01298

FLOOD CONTROL IN RESERVOIRS AND STORAGE POUNDS--A DISCUSSION,
Binnie and Partners, London (England).
M. J. H. West.
Journal of Hydrology, Vol 23, No 1-2, p 61-71, 1974. 2 fig, 1 ref.

Descriptors: *Flood control, *Flood routing, *Spillways, Equations, Hydrographs, Inflow, Discharge(Water), Peak discharge, Reservoirs, Water levels.
Identifiers: Storage trapezium.

Sarginson (1973) draws attention to the disadvantages of most conventional methods of flood routing when the objective is to design a spillway to control the peak outflow and water level within predetermined limits. This discussion derived a simple arithmetic experssion that can be used in these circumstances. (Dawes-ISWS)
W75-01301

SYSTEMATIZATION OF FLOOD CONTROL MEASURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY11, Proceedings Paper 10943, p 1537-1548, November 1974. 1 fig. NSF Grant GK-31512X.

Descriptors: *Classification, *Flood control, *Flood forecasting, *Flood plains, *Hydraulics, Floods, Flood insurance, Reservoirs, Dikes, Levees, Channels.
Identifiers: Flood prevention, River valleys.

A general review was given of trends in flood control. Five significant areas in systematization of flood control measures are: prevention, prediction, flood-plain proofing, physical measures of flood control (divided into extensive and intensive), and flood insurance. The extensive physical measures were divided into eight groups; levees and dikes, release basins, reservoirs, increased channel capacity, parallel channels, diversion channels, flood-plain polders, and flood-plain platforms. The classification scheme was an attempt for systematization of flood control measures mainly from the point of view of application of systems analysis, with a particular stress on the joint use of several flood control measures simultaneously. (Dawes-ISWS)
W75-01302

RANGE OF CUMULATIVE SUMS, I. EXACT AND APPROXIMATE EXPECTED VALUES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2E.
W75-01303

RIVER MILEAGE TABULATIONS FOR THE COLORADO RIVER BASIN. COMMUNITIES AND MAJOR TRIBUTARIES.
Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 7C.
W75-01309

AUSTRALIAN REPRESENTATIVE BASINS PROGRAMME--PROGRESS 1973.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 7C.
W75-01310

STREAM GAUGING INFORMATION, AUSTRALIA--SUPPLEMENT 1972.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 7C.
W75-01311

THE FLOODING OF LAKE PEDDER, FINAL REPORT OF LAKE PEDDER COMMITTEE OF ENQUIRY, APRIL 1974.
Department of the Environment and Conservation, Canberra (Australia).
Final Report ISBN 0 642 00604 0, April 1974. 317 p, 16 fig, 150 ref, 5 append.

Descriptors: *Planning, Investigations, *Decision making, *Management, *Lakes, Australia, Water resources development, Comprehensive planning, Political aspects, Social aspects, Alternate planning, Conservation, *Flooding, Environmental effects, Ecology, Aesthetics, Recreation, Land use, Water policy, Hydroelectric power, Education.
Identifiers: *Tasmania(Lake Pedder).

For eight years Lake Pedder has been the focus of a major environmental controversy. The lake, located in Lake Pedder National Park, would be flooded by the Gordon River Power Development Stage 1. Purpose of the Enquiry was to prepare a report for the Australian Minister for the Environment and Conservation concerning the circumstances leading to the flooding of Lake Pedder in order to assist him in an examination of the Australian Government's role with respect to the environment in relation to development projects. Reported in nine chapters were: (1) circumstances leading to the Committee of Enquiry formation; (2) committee's composition, terms of reference, and scope of activities; (3) background of the Lake Pedder controversy; (4) chronology of the Lake Pedder controversy; (5) major components of the Lake Pedder controversy; (6) the decision-making process; (7) the future management of Lake Pedder; (8) lessons for future planning and development; and (9) conclusions and recommendations. (Humphreys-ISWS)
W75-01315

SURVEY AND EVALUATION OF PLANT PATHOGENS OF ALLIGATORWEED (ALTERNANTHERA PHILOXEROIDES (MART.) GRISEB.),
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W75-01323

STATUS REPORT ON THE WATER LEVELS OF THE GREAT LAKES.
For primary bibliographic entry see Field 6E.
W75-01340

FLOOD INSURANCE AND DISASTER ASSISTANCE.
For primary bibliographic entry see Field 6F.
W75-01341

CHALMETTE PUBLIC HEARINGS TESTIMONY, (LOUISIANA).
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
October 19, 1972. 94 p.

Descriptors: *Flood control, *Coasts, *Coastal marshes, *Environmental effects, *Tidal marshes, Mississippi River, Port authority, Water pollution, Water pollution sources, Deltas, Saline water intrusion, Ecology, Fish management, Fisheries, Habitats, Highway effects, Natural resources, *Louisiana, Channeling.
Identifiers: Coastal zone management, Coastal waters.

This is a report of one of the several public hearings held to obtain first-hand information from the citizens of the coastal zone on their perception of the coastal zone resource problems. Testimony received has indicated a deterioration of water quality in St. Bernard Parish. A state representative spoke against a hurricane protection project, citing a letter from Florida which describes the effects of pollution on Florida lakes. Further testimony explained how marshland-destroying channels increase the danger of flooding and are unnecessary due to the availability of the Mississippi River as an alternative. A paper is included which examines agricultural land use in the coastal zone. The views of the Sierra Club on the flood control program and impact of uncoordinated development of the coastal area are presented. The chief problem is fragmented control by several governmental units administering a multitude of projects which threaten to destroy the ecological balance of the area. Considerable testimony is taken regarding the Port of New Orleans and the impact of its development on the coastal area. (Craig-Florida)
W75-01344

OPTICAL DATA PROCESSING AND PROJECTED APPLICATIONS OF THE ERTS-1

IMAGERY COVERING THE 1973 MISSISSIPPI RIVER VALLEY FLOODS,
Geological Survey, Reston, Va. EROS Program Office.
For primary bibliographic entry see Field 7B.
W75-01361

EFFECT OF MIXED-GRASS AND NATIVE-SOIL FILTER ON URBAN RUNOFF QUALITY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5F.
W75-01395

WATER QUALITY IN THE LOWER COLORADO RIVER AND THE EFFECT OF RESERVOIRS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W75-01396

EFFECT OF CHANGING WATER QUALITY AND SUPPLY ON IMPERIAL VALLEY, CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W75-01397

TWO DIMENSIONAL STOCHASTIC MODEL OF A HETEROGENEOUS GEOLOGIC SYSTEM,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-01399

A DESCRIPTION OF THE SOUTHEASTERN KISSIMMEE-EVERGLADES DRAINAGE BASIN WITH EMPHASIS ON HYDROLOGIC-ECONOMIC LINKAGES,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6B.
W75-01403

WATER FOR THE HUMAN ENVIRONMENT, VOLUME 1, CONGRESS PAPERS.
International Water Resources Association, Champaign, Ill.
For primary bibliographic entry see Field 6B.
W75-01428

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
F. E. Ellis.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 29-44, 1 fig, 6 tab, 13 ref.

Descriptors: *Water resources, *Planning, *Natural resources, *Energy, Fossil fuels, Coals, Oil, Natural gas, Oil shales, Electric powerplants, Environment, Economics, Social aspects, Central US, Rocky Mountain region, Southwest US, Resource development.

Development of natural resources in the Western United States has been and will continue to be dependent upon availability of water supplies. In addition to agriculture, water-oriented recreational activities, and other multipurpose functions, water is vital to expansion of existing industries. The development of new industries is often limited in areas that lack the necessary water supplies. It is expected that United States energy needs will be met from seven sources of supply in 1985. Oil, natural gas, coal, and hydroelectric power are contributors of long standing. Nuclear, shale oil, and synthetic coal-gas products are relative newcomers to the market. An expansion comparable to more than half of the existing capability of the petroleum or natural gas industries in 1970 will require technological advances, huge capital investments, and Federal and State cooperation with private industry. Interest appears to be in using coal in a dual-energy capacity. It can be converted to electrical energy or synthetic hydrocarbons, gasoline, and natural gas substitutes. Water is necessary to meet this technological development. Many interesting and complex socioeconomic and environmental factors as well as administrative interactions of Federal, State, and local governments and the private sector were discussed. (See also W75-01428) (Humphreys-ISWS)
W75-01430

SOME WATER RESOURCES PROBLEMS AND HUMAN ENVIRONMENT,
Haryana Public Works Dept., Chandigarh (India), Irrigation Works.
K. Chand, and R. K. Sabherwal.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 92-101. 3 tab, 10 ref.

Descriptors: *Water resources development, Water pollution effects, *Environment, *Water pollution sources, Water resources, Planning, *Groundwater recharge, *Reservoir silting, Fertilizers, Pesticides, *Weather modification, Groundwater mining, Overdraft.
Identifiers: *Human environment.

Four water resource problems discussed were sedimentation in reservoirs, drawing groundwater in excess of safe yield to maximize food production, pollution of water by fertilizers and pesticides, and weather modifications. The following actions were recommended: (1) additional reservoir sites should be investigated on tributary subbasins which in the past might not have been considered feasible. To some extent, such sites take care of hydro-power production, water conservation, and flood control aspects of existing reservoirs whose effective lives are becoming shortened; (2) present technology to artificially recharge under ground reservoirs should be improved to facilitate absorption of huge quantities of surface waters economically and at faster rates; (3) research to evolve food crop varieties with reduced water requirements for growth need to be intensified; (4) steps taken to combat groundwater contamination due to fertilizer and pesticide use in countries where the problem is known to exist should be studied and guide lines prepared to take action to protect the human environment; and (5) meteorological side effects of weather modification activities should be investigated on a global scale. (See also W75-01428) (Humphreys-ISWS)
W75-01436

SOME POSSIBILITIES FOR INTERNATIONAL DEVELOPMENT OF THE GANGES-BRAHMAPUTRA RIVER BASINS,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 6B.
W75-01441

THE RECREATION BENEFIT OF THE PA MONG PROJECT,
National Energy Authority, Bangkok (Thailand).
For primary bibliographic entry see Field 6B.
W75-01445

INTERBASIN TRANSFER OF WATER,
Malviya Regional Engineering Coll., Jaipur (India).
R. D. Verma.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 249-259. 2 fig, 17 ref.

Descriptors: *Water resources development, *Inter-basin transfers, *Planning, *Mathematical models, Water transfer, River basins, Political aspects, Regional development, Legal aspects, Economic feasibility, Environmental effects, Long-term planning, Dynamic programming, Hydrology.
Identifiers: *India(National Water Grid).

Interbasin transfers of large water bodies may soon become a necessity for the economic development of many countries. Technical, economic, political, and legal problems associated with interbasin transfers were discussed. The planning, design, and construction of large scale water transfer projects must be carried out by highly qualified individuals after detailed and full investigations. Mathematical optimization models should be used to select the least costly alignment of interbasin transfers of water. A mathematical optimization model applicable to India's National Water Grid was presented. Dynamic programming was recommended for determining a solution for the model. Developed countries and international organizations should help and cooperate with the developing countries in the planning and investigation of their large scale water diversion projects. (See also W75-01428) (Humphreys-ISWS)
W75-01452

INTERNATIONAL INTERBASIN TRANSFER OF WATER--THE NAWAPA PROJECT,
Parsons (Ralph M.) Co., Los Angeles, Calif.
R. P. Kelly.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 260-269. 4 fig.

Descriptors: *Inter-basin transfers, *Water resources development, *Planning, *Multiple-purpose projects, Water transfer, River basins, Governments, Federal government, State governments, Local governments, Legal aspects, Political aspects, Agriculture, Social aspects, Environment, Benefits, Energy transfer, Electric power, Canada, Mexico, United States, Hydrology.
Identifiers: *NAWAPA project, International inter-basin transfers.

Contrary to popular opinion, many of the major water transfer systems developed in the United States since 1900 have been constructed for supplying water to urban areas and not for agricultural use. Current demands for increased agricultural production have placed the development of large-scale water transfer systems in conflict with the current environmental movement of maintaining the status quo or reverting back to the illusionary virtues of a pristine countryside. Social and economic developments throughout the world are placing increasing pressures on agricultural production. There are only a few land masses in the world suitable for large-scale production of agricultural products. These areas can be made productive if adequate water is supplied. One such plan, the NAWAPA concept, can place millions of idle lands into production in Canada, the United States, and Mexico as well as provide a substantial surplus of electrical energy while at the same time accruing to the public numerous environmental benefits. Current technology is adequate to implement the program. Economics for the successful implementation of the program appear favorable.

One obstacle to the successful implementation of the NAWAPA concept, as in all large-scale programs, is politics--international as well as federal, state, and local. (See also W75-01428) (Humphreys-ISWS)
W75-01453

FLOODS AS A SUPPLYING FACTOR FOR WATER RESOURCES,
Padua Univ. (Italy).
D. Tonini.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 332-335.

Descriptors: *Water resources, *Floods, *Flooding, Water supply, Reservoirs, Hydrology, Floodwater, Planning.

Attention was given to some characteristics of storage flood control in order to use, however partially, this exceptional availability of water resources. Such resources, no matter how contingent, should not be disregarded and let flow as fast as possible into the sea. Floods, duly controlled, can offer a contribution toward substantially improving the regimen of underground and surface runoffs. From a technical point of view the works needed to do this are not generally very compelling; in most cases it is a question of 'favouring' the existing natural conditions through changes required to control existing settlements. Expending such works in time is a slow process primarily because their construction must be gradual so that the results of the early stages done may be kept under control. (See also W75-01428) (Humphreys-ISWS)
W75-01460

MECHANICAL AND HABITAT MANIPULATION FOR AQUATIC PLANT MANAGEMENT,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5C.
W75-01481

ON PREDICTING WATER RUNOFF FROM A SNOW COVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W75-01528

THE OCCURRENCE AND MOVEMENT OF LIQUID WATER IN THE SNOWPACK,
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2C.
W75-01529

APPLICATION OF THE ENERGY BUDGET FOR PREDICTING SNOWMELT RUNOFF,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 2C.
W75-01533

A NEW CALIFORNIA DEPARTMENT OF WATER RESOURCES TELEMETRY SYSTEM,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 7B.
W75-01552

ANALYSIS OF SNOW DISTRIBUTION USING TERRESTRIAL PHOTOGRAMMETRY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7B.
W75-01586

DRAIN CONSTRUCTION UNDER HIGH GROUNDWATER LEVEL CONDITIONS (O STROITEL 'STVE DRENAZHA V USLOVIYAKH VYSOKOGO URONNYA GRUNTOVYKH VOD),
For primary bibliographic entry see Field 8A.
W75-01629

CASE STUDY OF REGIONAL ANALYSIS TECHNIQUES FOR DESIGN FLOOD ESTIMATION,
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
For primary bibliographic entry see Field 2E.
W75-01648

4B. Groundwater Management

GROUNDWATER MANAGEMENT AND SALINITY CONTROL,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
R. G. Cummings, and J. W. McFarland.
Water Resources Research, Vol 10, No 5, p 909-915, October 1974. 37 ref.

Descriptors: *Groundwater resources, *Management, *Salinity, *Irrigation, *Water quality control, *Analytical techniques, Methodology, Mathematical models, Water utilization, Taxes, Downstream, Equations, Economics, Agriculture, Water supply, Leaching, Soil moisture, Capital, Economic efficiency, Costs, Benefits, Systems analysis, Optimization.
Identifiers: *Conjunctive use management, *Decision rules, Opportunity costs.

Presented is an analytical framework for an integrated approach to the water-salinity management problem. The framework recognizes (1) the intertemporal problem of endogenously determined water scarcity and the ramifications of such scarcity for the opportunity cost of water used for leaching purposes, and (2) optimal investment rates for capital and the role of capital in reducing salinity as well as in 'saving' scarce water supplies. A mathematical model is presented that may be useful in analyzing decision rules for the conjunctive management of groundwater reserves for use in irrigation and salinity control. Policy implications of this approach are examined, particularly as they relate to the difficulties associated with the use of economic incentives for the purpose of bringing about optimal water use patterns in a decentralized decision-making government. Alternative schemes for decentralized management via taxes and bribes are discussed. Taxes are described that bring about intradistrict efficiency in terms of use and salinity control when downstream externalities are ignored. When externalities are considered, it is shown that a unique pattern of resource use requires a given institutional structure for the management of bribes. (Bell-Cornell)
W75-01117

GROUNDWATER - BASEFLOW RELATIONSHIPS AND BASEFLOW PREDICTIONS FROM GROUNDWATER LEVELS ON PIEDMONT WATERSHEDS,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W75-01127

SUBSIDENCE IN UNITED STATES DUE TO GROUND-WATER OVERDRAFT--A REVIEW,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 2F.
W75-01159

VALLEY FILL IN THE ROSWELL-ARTESIA AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W75-01162

THE ANCLOTE AND PITHLACHASCOTEE RIVERS AS WATER-SUPPLY SOURCES,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-01164

HYDROGEOLOGY OF SOUTHEASTERN CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-01165

WATER RESOURCES OF THE MILFORD AREA, UTAH, WITH EMPHASIS ON GROUND WATER,
Geological Survey, Salt Lake City, Utah.
R. W. Mower, and R. M. Cordova.
Utah Department of Natural Resources, Salt Lake City, Technical Publication, No 43, 1974. 106 p, 14 fig, 5 plate, 17 tab, 55 ref, append.

Descriptors: *Water resources, *Groundwater, *Utah, Water yield, Alluvium, Hydrogeology, Data collections, Hydrologic data, Alluvial channels, Aquifers, Surface-groundwater relationships, Irrigation water.
Identifiers: *Milford(Utah).

The water needs of the Milford area of Utah are supplied mainly by the Beaver River, which enters through a canyon just east of Minersville, and by wells in unconsolidated materials. The 1914-71 average annual inflow of the Beaver River was 27,600 acre-feet. Pumpage from wells for irrigation has increased from 60 acre-feet in 1918 to 56,000 acre-feet in 1971, and pumpage for all other uses increased from 400 acre-feet in 1918 to 900 acre-feet in 1971. The unconsolidated materials underlying the valley contain the principal groundwater reservoir of the Milford area. Recharge to the principal groundwater reservoir for 1970-71 is estimated as 58,000 acre-feet annually. The largest sources of recharge were infiltration from irrigation ditches and irrigated fields (22,700 acre-feet), and underflow from the consolidated rocks of the mountains. Discharge from the principal groundwater reservoir for 1970-71 is estimated at 81,000 acre-feet annually. Discharge was mainly by irrigation wells and evapotranspiration (24,000 acre-feet). Increased pumping of groundwater since about 1950 has resulted in water-level declines of as much as 30 feet, which in turn caused compaction and land subsidence. The median dissolved-solids concentration is 569 milligrams per liter for water from wells. (Knapp-USGS)
W75-01168

GROUND-WATER RESOURCES OF THE LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
L. J. Bjorklund, and L. J. McGreevy.
Utah Department of Natural Resources, Salt Lake City, Technical Publication, No 44, 1974. 65 p, 12 fig, 5 plate, 12 tab, 65 ref, append.

Descriptors: *Groundwater, *Utah, *Water resources, Groundwater basins, Hydrogeology, Hydrologic budget, Withdrawal, Water yield, Water quality, Water balance, Hydrologic data.
Identifiers: *Bear River basin(Utah).

The relation of groundwater to surface water and the general water budget are discussed for the Bear River basin of Utah. The sources, occurrence, avialability, quantity, movement, chemical quality, and development of the groundwater are analyzed. The type and distribution of Quaternary

deposits and the chemical quality of the groundwater have been greatly affected by the succession of deep lakes and intervening lake recessions that occurred in the Lake Bonneville basin during Quaternary time. Marginal deposits (Quaternary) of the Lake Bonneville basin, mostly sand and gravel, and fractured limestone and sandstone of the Oquirrh Formation (Pennsylvanian and Permian) are the most productive water-bearing units. Water from most wells and springs tapping the marginal deposits contains from about 250 to 1,000 mg/liter of dissolved solids; yields are as much as 1,500 gal/min to wells and as much as 1,600 gal/min to springs. Interior deposits (Quaternary) of the Lake Bonneville basin, mostly silt and sand, generally yield smaller quantities of water of poorer quality, but the interior deposits are the only water-bearing unit in a large part of the area. Groundwater occurs in a principal groundwater system under both confined and unconfined conditions, in a shallow unconfined system, and in perched systems. About 4,000 acre-feet of water was discharged from wells in 1971. Groundwater levels fluctuate seasonally but have changed little on a long-term basis since the mid-1930's. Shallow wells in the central-plain area supply water for many lawns and gardens. All public-water supplies are from groundwater sources. (Knapp-USGS)
W75-01169

GROUND-WATER HYDROLOGY OF THE HOLLISTER AND SAN JUAN VALLEYS, SAN BENITO COUNTY, CALIFORNIA, 1913-68,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01173

GROUND WATER IN HASKELL COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-01174

WATER-TABLE DECLINE IN THE ALLUVIAL AQUIFER, SPRING 1964 TO SPRING 1974, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Pueblo, Colo.
For primary bibliographic entry see Field 7C.
W75-01177

STRUCTURE AND STRATIGRAPHY IN THE VICINITY OF THE SHELL OIL CO. SANTA FE PACIFIC NO. 1 TEST WELL, SOUTHERN SANDOVAL COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
B. A. Black, and W. L. Hiss.
New Mexico Geological Society Guidebook, 25th Field Conference, Ghost Ranch (Central-Northern New Mexico), p 365-370, 1974. 4 fig, 2 plate, 2 tab, 13 ref.

Descriptors: *Geologic units, *New Mexico, *Stratigraphy, Aquifers, Geology, Sedimentary rocks, Faults(Geologic), Boreholes.
Identifiers: *Albuquerque-Belen basin(NM).

The stratigraphic section beneath the Santa Fe Group in the northern part of the Albuquerque-Belen basin, New Mexico, was obtained from a wildcat oil-test well. A generalized geologic section extending approximately 60 miles from the Rio Puerco on the west across Mesa Prieta and terminating in the Cerillos Hills is shown. The potential for development of additional oil, gas, uranium, coal, geothermal, and groundwater resources makes the geologic understanding of this area not only of academic interest but also of great economic importance for the future of New Mexico. (Knapp-USGS)
W75-01179

GROUND WATER IN THE SOUTHWESTERN PART OF THE JEMEZ MOUNTAINS VOLCANIC REGION, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W75-01180

WATER IN THE METHOW RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4A.
W75-01181

DRAINAGE SYSTEM,
For primary bibliographic entry see Field 8B.
W75-01188

LITTORAL FLOW TRAP OR BASIN,
Butterworth (Helen Libbey), Smithfield, Va. (assignee)
For primary bibliographic entry see Field 8B.
W75-01198

THEORETICAL DISCUSSION OF GROUNDWATER FLOW TOWARDS A SINK,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 2F.
W75-01241

THE OCCURRENCE OF NITRATE IN GROUNDWATER,
South Australia Engineering and Water Supply Dept., Adelaida.
For primary bibliographic entry see Field 5B.
W75-01247

AN EXAMPLE OF THE USE OF BACTERIOPHAGE AS A GROUNDWATER TRACER,
Halcrow (William) and Partners, London (England).
For primary bibliographic entry see Field 2F.
W75-01291

PARTIALLY PENETRATING MULTIPLE-WELL SYSTEM IN A CONFINED AQUIFER WITH APPLICATION TO A RELIEF WELL DESIGN,
Indian Inst. of Tech. Kharagpur. Dept. of Civil Engineering.
S. N. P. Sharma.
Journal of Hydrology, Vol 23, No 1-2, p 1-37, 1974. 12 fig, 6 tab, 24 ref.

Descriptors: *Wells, *Penetration, *Mathematical studies, Equations, Drawdown, Discharge(Water), Artesian aquifers, Drainage wells, Well spacing, Design, Potentiometric level, Uplift pressure, Groundwater barriers, Recharge, Boundaries(Surface), Piezometers.
Identifiers: *Multiple-well systems, *Relief wells, Shielding, Equivalent ditch approach.

The concept of average pressure around a partially penetrating well along with the theory of images and the principle of superposition were employed to derive steady-state discharge and drawndown expressions for a partially-penetrating multiple-well system in a confined aquifer. Equations were derived for: (1) the well being fed from a line source, (2) the well array placed in a semi-infinite strip with both longitudinal sides forming potential boundaries, and (3) a semi-infinite strip with potential boundary along one longitudinal side and an impermeable boundary along the other side. Equations were obtained for drawdown factors of several well groups of equal discharge with circular or straight-line boundaries. Expressions were suggested for the penetration factor alpha, applicable to a well near an infinite line source. The derived results provided an analytical method for spacing a partially penetrating relief well system, and also used in studying partial penetration on shielding and in determining parameters involved in an 'equivalent ditch' approach. Solutions for fully penetrating wells were obtainable as a particular case (alpha equal to 1) of the general solutions presented. (Visocky-ISWS)
W75-01295

ANALOG SUBROUTINES FOR THE FINITE ELEMENT METHOD,
California Univ., Los Angeles. School of Engineering and Applied Science.
O. P. Singla.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 527, $7.25 in paper copy, $2.25 in microfiche. PHD Thesis, 1972, 181 p. OWRT-B-150-CAL(3).

Descriptors: *Analog models, *Finite element analysis, Computer models, Mathematical models, Methodology, Dispersion, Underground storage, Groundwater movement, Model studies.
Identifiers: *Matrix methods, Discrete-continuous techniques, Error analysis.

Analog subroutines are proposed, designed and implemented in conjunction with a digital computer to increase the efficiency of the Finite Element Method. To measure the usefulness of the Analog subroutines, an efficiency criterion called 'Figure of Merit' is developed. Based on this criterion of Figure of Merit (FOM) an increase in efficiency by a factor of 2 is obtained for the Matrix Inversion Analog Subroutine. Engineering design and error analysis is carried out for the Matrix Step-up Analog Subroutine and a theorem for the error propagation is presented along with error estimates and savings in time estimates. In addition a new Discrete-Continuous Technique is developed and implemented. Part of the field is solved by analytical means and the rest by the Finite Element Method. The two solutions are joined together by an analog subroutine. This new technique offers a great advantage in problems where sharp gradients occur. Efficiency improvement by a factor of 3 is realized in solving a underground water dispersion problem. Also, savings in storage are obtained. The application of the Finite Element Method to field problems is reviewed with an emphasis on the physical meaning of the variational functional; the computer implementation of the method is given. A detailed analysis of some of the computation aspects of the method is carried out and advantages and disadvantages of certain choices and alternatives are outlined. (Snyder-California, Davis)
W75-01320

HYDROLOGIC EFFECTS OF STRIP COAL MINING IN SOUTHEASTERN MONTANA - EMPHASIS: ONE YEAR OF MINING NEAR DECKER,
Montana Bureau of Mines and Geology, Butte.
For primary bibliographic entry see Field 5B.
W75-01329

GEOTHERMAL RESOURCES.
Hearings--Subcomm on Water and Power Resources, Comm on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, August 10 and 11, 1973. 771 p.

Descriptors: *Geothermal studies, *Thermal properties, *Thermal water, *Steam, *Powerplants, Geology, Geophysics, Borehole geophysics, Heat flow, Temperature, Thermal conductivity, Thermal springs, Geysers, Hot springs, Water resources development, Pressure, Subsurface waters, Heated water, Land use, Environmental effects, Energy, Energy conversion, Water resources.

The potential for the production of electricity and heat energy from geothermal resources was discussed. The appropriate Federal role in solving the particular energy problems of the Pacific Northwest through the assistance of geothermal resource development was explored. The governor of Idaho indicated there are at least twenty-five sites in that state where hot springs, or wells, or the geology indicates the presence of an underground heat resource. Testimony from various Idaho officials was heard on the need for the development of geothermal resources in that state and the possibilities for that development. Much testimony was received regarding the unique potential of Idaho for geothermal energy development. Further testimony concerned the problems of developing the resource. A proposal for a demonstration geothermal power plant was introduced, and testimony regarding its feasibility and implementation was taken. A Sierra Club representative presented a statement on the potential of very serious land use and environmental impact controversies existing in the development of geothermal energy. (Craig-Florida)
W75-01342

GEOLOGY OF SALARS IN NORTHERN CHILE,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2H.
W75-01351

MAP SHOWING CHLORIDE-ION CONCENTRATION IN SEDIMENTARY ROCKS OF PERMIAN (GUADALUPIAN) AGE, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W75-01352

DATA FOR SELECTED WATER WELLS, YOUNTVILLE QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01366

DATA FOR SELECTED WATER WELLS, NAPA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01367

DATA FOR SELECTED WATER WELLS, CALISTOGA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01368

DATA FOR SELECTED WATER WELLS, RUTHERFORD QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01369

DATA FOR SELECTED WATER WELLS, ST. HELENA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-01370

GROUNDWATER RECHARGE AND QUALITY TRANSFORMATIONS DURING THE INITIATION AND MANAGEMENT OF A NEW STABILIZATION LAGOON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5D.
W75-01387

SOME WATER RESOURCES PROBLEMS AND HUMAN ENVIRONMENT,
Haryana Public Works Dept., Chandigarh (India), Irrigation Works.
For primary bibliographic entry see Field 4A.
W75-01436

INTEGRATED SURFACE-GROUND WATER DEVELOPMENT ON A REGIONAL BASIS--THE SAN ANTONIO, TEXAS STUDY,
Texas Water Development Board, Austin.
L. F. Tischler.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 279-290. 2 fig, 3 ref.

Descriptors: *Water resources development, *Planning, *Comprehensive planning, *Regional development, River basin development, Regional economics, Hydrologic aspects, Alternate planning, *Texas, *Conjunctive use, Groundwater, Surface waters, Arid lands, Social aspects, Ecology, Environmental effects, Hydrology, Water supply.
Identifiers: San Antonio(Texas).

The Texas Water Development Board, the State water resources planning agency, is currently conducting a multi-disciplinary planning effort designed to develop alternative development and management plans for meeting the long-range water needs of a three river basin, semi-arid region of Texas. The San Antonio Regional Environmental Project will provide alternatives, based on the conjuctive use of available surface and groundwater supplies, for maintaining the economic, environmental, and social systems of the area. In order to facilitate the planning studies and assure detailed analyses of the alternatives, the techniques of systems analysis and operations research are being extensively used. The various studies being undertaken as parts of the project were described. (See also W75-01428) (Humphreys-ISWS)
W75-01455

GROUND WATER ASSESSMENT AND DEVELOPMENT IN DEVELOPING COUNTRIES,
Uttar Pradesh Irrigation Dept., Lucknow (India).
H. B. S. Seth.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 303-310. 3 ref.

Descriptors: *Water resources development, *Groundwater resources, *Planning, *Project planning, Safe yield, Research priorities, Exploration, On-site investigations, Aquifers, Hydrogeology, Hydrologic aspects, On-site tests.
Identifiers: India, Developing countries, Groundwater assessment.

There is a great need for research and innovation of an economical and less-time consuming method in the quantitative assessment of groundwater. It is also felt that the geohydrological data should be collected on a global basis primarily by world agencies such as the United Nations Development Programm or International Hydrological Decade, etc. Such data and information should be shared by all the countries who need it. This will be of great help to the developing countries, whose economy is dependent upon irrigated agriculture. In this connection it was suggested that the developing countries should also adopt strict legislative measures to guide and plan groundwater development before serious problems of overdraft, undermining, and land subsidence are created, and the available groundwater destroyed. (See also W75-01428) (Humphreys-ISWS)
W75-01457

WATER RESOURCES MANAGEMENT IN COASTAL PLAIN AQUIFERS,
Wisconsin Univ., Oshkosh.
C. W. Fetter, Jr.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 322-331. 31 ref.

Descriptors: *Water resources, *Management, *Coastal plains, *Aquifer management, Aquifer systems, United States, Geology, Hydrogeology, Groundwater, Saline water intrusion, Saline water, Freshwater, Waste water treatment, Ecosystems, Environment.

Coastal plain aquifers are found along the East and Gulf Coasts of the United States, as well as other places in the world. Large rivers flow across the land surface and abundant subsurface water is usually present. Although a copious supply of water is available, poor water resources management has resulted in the development of many problems. Water quality degradation, saline water encroachment and disruption of coastal zone ecosystems have occured in a number of localities. All of these problems can be overcome through proper water resources management by: (1) wastewater treatment including reduction of the biochemical oxygen demand, elimination of materials toxic to fresh water and marine organisms, and removal of phosphate and nitrogen compounds; (2) controlling saline water encroachment to increase the yield of coastal aquifers; (3) artificial aquifer recharge to expand the groundwater potential of the coastal aquifer; and (4) identifying critical areas of the coastal ecosystem and protecting them from damaging encroachment by civilization. (See also W75-01428) (Humphreys-ISWS)
W75-01459

APPLICATION OF GROUNDWATER MEASUREMENTS BY MEANS OF RADIOISOTOPES ON GROUNDWATER EXPLORATION,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
W. Drost.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 357-369. 7 fig, 9 ref.

Descriptors: *Water resources development, *Groundwater movement, *Tracers, *On-site investigations, Subsurface flow, On-site data collections, Exploration, Instrumentation, Surveys, Radioisotopes, Groundwater, Velocity, Groundwater potential, Water pollution, Methodology, Testing procedures.

To measure the filtration velocity and the flow direction of groundwater, single-borehole methods using radioactive isotopes have been developed. Together with multiple-borehole methods they have been applied in the Federal Republic of Germany during the last decade in the solution of groundwater exploitation and waste disposal problems. The results provided valuable insights into potential groundwater yield, the origin of the groundwater, the vertical velocity profile within the aquifer, groundwater pollution risks, and the establishment of protection zones for groundwater production installations. Results of five field investigations were presented. (See also W75-01428) (Humphreys-ISWS)

W75-01463

BERMUDA TUNNELS FOR FRESH WATER,
Williams and Works, Grand Rapids, Mich.
T. C. Williams.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 370-375.

Descriptors: *Water resources development, *Water supply, *Groundwater, Islands, Aquifers, *Tunnels, Freshwater, Water quality, Water resources, Water supply development.
Identifiers: *Bermuda.

Water resources development for water supply has included cisterns, excavated wells, infiltration galleries, and the present tunnel system. Available fresh water supplies in Bermuda were augmented by the construction of tunnels designed to permit skimming off a very thin lens of fresh water under the island. The main island is very small and the limestone rock very porous so the maximum height of groundwater table is less than one foot above sea level. The tunnels have proven to be much more efficient than any previous scheme for development of this rather fragile resource. (See also W75-01428) (Humphreys-ISWS)
W75-01464

EFFECTS OF PIPE MATERIALS ON QUALITY OF WATER SAMPLES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-01627

4C. Effects On Water Of Man'S Non-Water Activities

INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBAN BASINS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. A. Rao, and J. W. Delleur.
Hydrological Sciences Bulletin-des Sciences Hydrologiques, Vol 19, No 2, p 185-198, June 1974. 7 fig, 4 tab, 21 ref. OWRT-B-022-IND(4).

Descriptors: *Unit hydrographs, *Hydrograph analysis, *Urban hydrology, *Rainfall-runoff relationships, Hydrographs, Storm runoff, Time of concentration, Urban runoff, Urbanization, Overland flow, Cities, Analysis, Base flow, Discharge(Water), Floods, Storms, Time lag, Watersheds(Basins), Hyetographs, Rainfall, Peak discharge, Precipitation excess.

The effects of urbanization of a basin on the runoff have been investigated in the past by the use of linear conceptual models in which the time lag appears as an important parameter. However, in this approach the effects of noise in the data, of sampling rate, of errors due to the lack of synchronization between the effective rainfall and runoff on the instantaneous unit hydrograph do not become readily apparent. A case in which the cumulative effects of these factors were predominant was presented as an example of the possible difficulties which might be encountered in the analysis of urban hydrological data by the unit hydrograph method. The disadvantages of relating the peak discharge, the time to peak discharge and the time lag to the physiographic characteristics alone were discussed. Alternative regression relationships which involve storm characteristics along with the physiographic characteristics to estimate the peak discharge, time to peak discharge and time lag were presented. (Humphreys-ISWS)

W75-01124

ESTIMATION OF AGRICULTURE-FORESTRY TRANSITION MATRICES FROM AERIAL PHOTOGRAPHS,
North Carolina State Univ., Raleigh. School of Forest Resources.
H. J. Van Loock, W. L. Hafley, and R. A. King.
Southern Journal of Agricultural Economics, Vol 5, No 2, p 147-153, December 1973. 7 tab, 7 ref. OWRT B-010-NC(5). 14-01-0001-1934.

Descriptors: *Land use, *Land management, Rural areas, Water balance, Runoff, *Remote sensing, *Aerial photography, *North Carolina, Estimation, Agriculture, Forestry, Environmental effects, Urbanization.
Identifiers: Lake Michie(NC), *Transition matrices, *Dial Creek watershed(NC).

Transition matrices are an important research tool analyzing land use changes. A case study is presented of the development of such matrices using aerial photographs as a data base, combined with careful field observations to establish current land use practices at the selected sample points. Photographic data from flights at well-spaced intervals provide a basis for measuring and evaluating changes in land use. One important aspect of land use change demonstrated by the example is the significance of total movement of acreage among different uses as opposed simply to periodic net acreage change. In the study, total movement was an important concern in measuring the hydrologic influence of land use changes. Transition matrices are also applicable to the investigation of problems of environmental quality arising out of shifts from either agricultural or forestry uses to urban uses. Conditional probabilities are useful in quantitative analysis of the forces responsible for land use changes. (McJunkin-North Carolina State)
W75-01231

THE ENERGY AND MOISTURE BUDGET OF THE URBAN INTERFACE AS AFFECTED BY CYCLONIC STORMS - PHASES I AND II,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W75-01398

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE MEASUREMENT OF PHYTOPLANKTON PARAMETERS IN NATURE,
Kinneret Limnology Lab., Tiberias (Israel).
T. Berman, and R. W. Eppley.
Sci Prog. Vol 61, No 242, p 219-239, 1974, Illus.
Identifiers: ATP, Chlorophyll, *Measurement, Nitrogen, Nutrients, Photosynthesis, *Phytoplankton, Respiration, Absorption, *Algal biomass, *Pollutant identification.

Indirect techniques (photosynthesis, chlorophyll, ATP, respiration, autoradiography, N and other nutrient uptake) developed to quantitate the amounts and physiological activities of the algal biomass are described.--Copyright 1974, Biological Abstracts, Inc.
W75-01104

A NEW METHOD FOR ESTIMATING PRODUCTIVITY IN STANDING WATERS USING FREE OXYGEN MEASUREMENTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
G. M. Hornberger, and M. G. Kelly.
Water Resources Bulletin, Vol 10, No 2, p 265-271, April 1974. 10 ref, 4 fig. OWRT-A-045-VA(1).

Descriptors: *Productivity, *Oxygen, *Fourier analysis, Equations, Mixing, Methodology, Measurement, Pollutant identification, Water pollution effects.
Identifiers: Diurnal temperature, Fourier coefficients, Mass-balance equations, *Vertical mixing.

Continuous measures of net productivity at discrete depths in standing waters may be obtained using diurnal free oxygen measurements and estimates of the vertical mixing. If oxygen concentration and vertical mixing are known in a laterally homogeneous water body, the only unknown term in the oxygen mass-balance equation is net productivity. If this is represented by a Fourier series, the equation may be solved and Fourier coefficients selected so that the sum of square errors between the oxygen measurements and predictions of the equation is minimized; the Fourier series then describes the diurnal variation of net productivity.
W75-01107

THE OXYGEN SAG EQUATION: NEW PROPERTIES AND A LINEAR EQUATION FOR THE CRITICAL DEFICIT,
International Business Machines Corp., Gaithersburg.
M. Arbabi, J. Elzinga, and C. ReVelle.
Water Resources Research, Vol 10, No 5, p 921-929, October 1974. 6 fig, 51 equ, 12 ref.

Descriptors: *Oxygen sag, *Equations, *Dissolved oxygen, *Water quality, Management, Linear programming, Streamflow, Downstream, Mathematical models, Simulation analysis, Systems analysis.

Some newly discovered properties of the Streeter-Phelps oxygen sag equation are examined. It is proved that the critical dissolved oxygen (DO) deficit is a convex function and can be represented by a conical surface. By using these properties, it is shown how to approximate with a high degree of accuracy the critical deficit as a linear function of the initial biochemical oxygen demand (BOD) loading and initial oxygen deficit. The linear approximation of the critical DO deficit, based on the minimization of the maximum error, is derived. The closed form equations for the derivation of the coefficients of the linear approximations are presented for the Streeter-Phelps model. A linear programming procedure is developed to compute the coefficients for Dobbins' stream quality model as well as for other models. The maximum percent error is less than about 6% in estimating the critical DO deficit with the linear approximation. The linear approximating equation will find use in mathematical programming formulations of water quality management problems. (Bell-Cornell)
W75-01118

WATER QUALITY MONITORING ON THE MISSISSIPPI RIVER HAS ITS PITFALLS,
Saint Louis Metropolitan Sewer District, Mo.
B. A. Rains, and R. S. Flick.
Paper presented at 72nd Annual Meeting, American Institute of Chemical Engineers, St. Louis, Missouri, May 21-24, 1972. 41 p, 17 fig, 4 tab.

Descriptors: *Sampling, *Monitoring, *Mississippi River, *Water quality, *On-site investigations, Research equipment, Boats, Instrumentation, Water properties, Water chemistry, Water pollution sources, Laboratory tests, Missouri.
Identifiers: *Sampling methods, St. Louis(Missouri).

Monitoring the water quality of the 40 mile stretch of the Mississippi River between Alton, Illinois and the mouth of the Meramec River has created

some interesting problems in equipment utilization and sample collection for the St. Louis Metropolitan Sewer District. The Missouri River converges with the Mississippi at a point north of St. Louis creating a combined mean flow at St. Louis of approximately 116 billion gallons per day. The river is swift, turbulent, and shallow in many places. To facilitate field sampling procedures, a 30ft x 10ft steel boat was purchased. It had a draft of only 18 inches and required modification to cope with river conditions. It was equiped with adequate safety gear as well as a Honeywell W-10 Analog Water Quality Monitoring System, sampling tank, sensors and pumping equipment for sample collection. The Mississippi River is being monitored to determine changes in temperature, dissolved oxygen, BOD, COD, pH, phenol, fecal coliform and river flow. Tests for the past four years indicate no drastic changes in water quality. The greatest concentration of suspended solids occur during peak storm water run-off periods. The Missouri River contributes the largest portion of suspended solids. Overall water quality is not as bad as originally considered. The high volume of flow in the river at St. Louis provides a tremendous assimilative capacity. (Poertner)
W75-01139

DETERMINATION OF THE RADON CONTENT IN WATER BY A WIDELY USED INSTRUMENT, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Krivoi Rog (USSR).
V. A. Somko.
Gig Sanit. Vol 38, No 5, p 94-96. 1973, Illus.

Descriptors: *Analytical techniques, Instrumentation, *Pollutant identification.
Identifiers: *Radon.

To analyze the content of Rn in water widely used and cheap instruments should be used: SR P-2 'Kristall' radiometer and PP-16 (B-4) scaler. All radiological sanitary and epidemiological stations have these instruments. The instruments do not require any modifications and do not need additional adjustments. The construction of the instruments and measurement procedure are presented.--Copyright 1974, Biological Abstracts, Inc.
W75-01153

WATER RESOURCES DATA FOR KANSAS, 1973: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W75-01160

MERCURY IN WATERS OF THE WESTERN UNITED STATES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5B.
W75-01166

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, NOVEMBER 1970-APRIL 1972.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 5B.
W75-01170

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, AUGUST 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W75-01172

AN INVENTORY OF PUBLISHED AND STORED CHEMICAL ANALYSES OF SURFACE WATER IN CALIFORNIA, 1906-71,
Geological Survey, Menlo Park, Calif.
A. L. Davis.
Open-file report, July 24, 1974. 40 p, 1 ref.

Descriptors: *Data storage and retrieval, *California, *Hydrologic data, *Water analysis, *Water quality, Water chemistry, Chemical analysis, Data collections.

This inventory was prepared as a reference to chemical-quality data at surface-water stations that have been published in water-supply papers and annual basic-data reports of the U.S. Geological Survey since 1906. Data for these stations have been put into the data storage system since 1961. Data for some stations, where special studies were made, have been entered into the system for the period of record for those particular sites. (Knapp-USGS)
W75-01178

A STUDY OF CHEMICALS IN DRINKING WATER FROM SELECTED PUBLIC WATER SYSTEMS, NEW YORK STATE, OCTOBER 1970 TO MARCH 1971.
New York State Department of Health, Albany. Water Supply Section.
Public Water Supply Report, August 1973. 30 p, 1 fig, 4 tab, 8 ref.

Descriptors: *Water supply, *New York, *Water quality, *Potable water, Dissolved solids, Heavy metals, Pesticides, Public health.

A reconnaissance of drinking water quality was directed to finding out not only what chemicals may be found in some drinking waters of New York State but also the ranges of concentrations of these chemicals. Health-related chemical constituents in treated and distributed water, in general, were not found to be in excess of limits in accepted standards. Some differences between surface waters and groundwaters seem to be evident. No pesticides, for example, were detected in groundwaters. Repetitive sampling and analyses of some systems, especially from surface sources, is prerequisite for determination of a range of critical constituents under changing conditions. A determination of the geographic distribution of the undesirable chemical-constituents such as heavy metals may be beneficial in the study of possible relationships between certain diseases and public drinking water sources. (Knapp-USGS)
W75-01182

PHOSPHORUS INPUTS FROM THE ATMOSPHERE,
DePaul Univ., Chicago, Ill. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-01199

RADIOTELEMETRY OF HYDROMETEROLOGICAL DATA,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W75-01214

INDUSTRIAL AND MUNICIPAL WASTES: ACTION OF SOME WATER SOLUBLE POLLUTANTS ON FISH,
Michigan State Univ., East Lansing. Dept. of Physiology.
For primary bibliographic entry see Field 5C.
W75-01215

HEAVY METAL CONCENTRATION IN FISH TISSUE OF THE UPPER CLARK FORK RIVER,
Montana Univ., Missoula. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W75-01216

A CRITICAL ANALYSIS OF WARBURG RESPIROMETRY FOR BOD DETERMINATIONS OF POLLUTED RIVERS,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
T. J. Tuffey, J. V. Hunter, and J. P. Hewitt.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 439; $3.25 in paper copy, $2.25 in microfiche. Presented at 24th Annual Purdue Industrial Waste Treatment Conference, West Lafayette, Ind., May 7-9, 1974. 13 p, 5 fig, 2 tab, 10 ref. OWRT B-027-NJ(1). 14-01-0001-3030.

Descriptors: Oxygen demand, *Nitrification, Water pollution sources, *Measurement, *Biochemical oxygen demand, Pollutant identification, Instrumentation, Nitrates, Carbonates.
Identifiers: *Warburg respirometry.

The use of the Warburg respirometer with a 50 ml sample size is evaluated for determining both carbonaceous and nitrogenous BOD. Because of the relatively low oxygen demand exerted by polluted streams, the variability inherent in the Warburg was found to be unacceptable when compared to a technique using a DO probe and ordinary BOD bottles. Conventional Warburg techniques were found to be totally unacceptable for studying stream nitrification. Due to the use of KOH as a CO2 absorbant, the pH of the sample often climbs to over 10. This high pH and resultant lack of free CO2 inhibits the Nitrobacter stage of nitrification but not the Nitrosomonas stage. As a result, one associates an increased demand due to nitrification, but it only accounts for the oxidation of ammonia to nitrite and not nitrite to nitrate. These observations are substantiated through MPN enumerations of the nitrifying bacteria, chemical analyses for ammonia, nitrite and nitrate, and measured oxygen consumption. The noise level of the Warburg is too great to adequately measure BOD in stream samples and the environment inside the flask too severe to allow normal nitrification. The errors in using this instrument are highlighted and alternate techniques proposed.
W75-01217

SULFATE UPTAKE AS A MEASURE OF PLANKTONIC MICROBIAL PRODUCTION IN FRESHWATER ECOSYSTEMS,
Wayne State Univ., Detroit, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-01229

CHEMISTRY,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan.
In: Interdisciplinary Environmental Approaches, A. E. Utton and D. H. Henning, Eds., Educational Media Press, Costa Mesa, Calif, p 191-204, 1974. 1 ref. OWRT B-095-MO(1). 14-31-0001-4099.

Descriptors: *Chemistry, Environment, Soils, Energy, Resources, Education, *Environmental effects, Publications.
Identifiers: Environmental chemistry.

The readings were designed to collect a body of theory for interdisciplinary approaches to environmental problems. The book draws from 20 interrelated academic disciplines. It is designed for use in interdisciplinary environmental courses and to communicate to persons wanting a general understanding of environmental theory. The 'Chemistry' chapter deals with environmental chemistry as the science dealing with the sources, reactions, and effects of chemical species in the water, soil, air, and biological environments. The relationship of environmental chemistry to energy production and resource utilization is discussed. Environmental chemistry at a general level is outlined in detail.
W75-01230

APPLICATION OF TOTAL ORGANIC CARBON MEASUREMENTS AND CORRELATIONS WITH OXYGEN DEMAND PARAMETERS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
N. H. Pilkington, and E. A. Swinton.
Water (Journal of the Australian Water and Wastewater Association) Vol 1, No 2, p 19-21, June 1974. 2 fig, 11 ref.

Descriptors: *Analytical techniques, *Biochemical oxygen demand, *Chemical oxygen demand, *Organic loading, Organic compounds, Water pollution, *Pollutant identification, Monitoring, Water quality, Correlation analysis.
Identifiers: *Total organic carbon.

The measurement of total organic carbon (TOC) is a rapid, specific and precise method which complements the biochemical oxygen demand (BOD) and chemical oxygen demand (COD) tests for the determination of organic pollution loading. Although there is no fundamental relationship between TOC and either BOD or COD, empirical correlations may be established in most cases. However, the potential of the TOC method is not being fully realized when the results are used in this way. TOC can be used without reference to other techniques for process control and for effluent quality monitoring. (CSIRO)
W75-01245

DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF NATURAL AND WASTE WATERS CONTAINING SMALL AMOUNTS OF ORGANIC POLLUTANTS (OPREDELENIE OKISLYAEMOST' PRIRODNYKH I STOCHNYKH VOD PRI MALOM SODERZHANII V NIKH ORGANICHESKIKH ZAGRYAZNENII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
Yu. Yu. Lur'e, and Z. V. Nikolaeva.
Zhurnal Analiticheskoi Khimii, Vol 28, No 7, p 1433-1434, July 1973. 1 ref. English summary.

Descriptors: *Water analysis, *Pollutant identification, *Analytical techniques, *Chemical oxygen demand, *Waste water(Pollution), *Colorimetry, Chromium, Organic compounds, Organic loading, Industrial wastes.

A colorimetric method is described for determining the COD of natural waters and/or industrial aqueous effluents containing traces of organic pollutants. The technique involves oxidation of a sample with potassium chromate, separation of trivalent from hexavalent Cr by sorption on MgO at pH 10.5, and photometric determination of the trivalent Cr by virtue of the color formed with Complexone III (chelating agent). (Chern-IPC)
W75-01258

A VOLUMETRIC METHOD FOR THE DETERMINATION OF SULFATES,
Western Michigan Univ., Kalamazoo. Dept. of Paper Science and Engineering.
L. C. Aldrich.
Tappi, Vol 57, No 7, p 122-123, July 1974. 1 fig, 4 ref.

Descriptors: *Water analysis, *Sulfates, *Analytical techniques, *Industrial water, Closed circuits, *Recirculated water, Water conservation, *Pulp and paper industry, Monitoring, Water reuse, Solutes, Aqueous solutions, *Pollutant identification.
Identifiers: White water(Paper machine), Aluminum potassium sulfate.

The closing of paper mill water systems is often accompanied by accumulation of chemicals, such as papermakers' alum, in recirculated white waters. For the monitoring of soluble sulfates in water, a reliable and fairly rapid analytical procedure has been developed. It involves removal of cations with an ion exchanger, addition of isopropyl alcohol and an excess of barium perchlorate, and back titration with sulfuric acid in the presence of Arsenazo III as end-point indicator. (Brown-IPC)
W75-01259

WATER AND WASTE FLOW MEASUREMENT,
Fischer and Porter Co., Warminster, Pa.
For primary bibliographic entry see Field 7B.
W75-01262

MULTIRESIDUE ANALYSIS OF FOURTEEN ORGANOPHOSPHORUS PESTICIDES IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. D. Ripley, R. J. Wilkinson, and A. S. Y. Chau.
Journal of the Association of Official Analytical Chemists, Vol 57, No 5, p 1033-1042, Sept. 1974. 6 fig, 6 tab, 17 ref.

Descriptors: *Organophosphorus pesticides, *Analytical techniques, *Water analysis, Pollutants, Pesticide residues, Organic pesticides, Pesticides, Diazinon, Separation techniques, Emulsions, Gas chromatography, Flame photometry, Chemical analysis, Phosphorus, Phosphorus compounds, Water properties, Sulfur compounds, *Pollutant identification.
Identifiers: Phorate(Thimet), Disulfoton(Di-Syston), Ronnel(Trolene), Methyl parathion, Malathion, Parathion, Cruformate(Ruelene), Methyl trithion, Ethion, Carbophenothion(Trithion), Imidan, Azinphosmethyl(Guthion), Azinphosethyl(Ethyl guthion).

A method is described for the determination of 14 organophosphorus pesticides in natural waters at less than microgram/liter (ppb) concentrations. The pesticides include Phorate (Thimet), Diazinon, Disulfoton (Di-Syston), Ronnel (Trolene), Methyl parathion, Malathion, Parathion, Cruformate (Ruelene), Methyl trithion, Ethion, Carbophenothion (Trithion), Imidan, Azinphosmethyl (Guthion), and Azinphosethyl (Ethyl Guthion). Two extraction methods are described: the vortex stirring method for water that forms light emulsions and the separatory funnel method for water that forms heavy emulsions during extraction. Extraction recoveries were 95-110% for all compounds except cruformate (115%). Two concentration methods are also described with recoveries of 95-116%. Compounds are determined by isothermal gas chromatography using a flame photometric detector that is quantitatively sensitive to phosphorus. The sensitivity of the method for most of the 14 compounds is 0.01 ppb, using 1 liter of water. Retention times of all compounds are constant during isothermal analysis. Possible losses due to storage are also examined. (Witt-IPC)
W75-01265

OCCURRENCE OF PESTICIDES IN SELECTED WATER SOURCES IN ISRAEL,
Water Planning for Israel, Tel-Aviv.
For primary bibliographic entry see Field 5B.
W75-01268

THE ABSORPTIOMETRIC DETERMINATION OF ALUMINUM IN WATER. A COMPARISON OF SOME CHROMOGENIC REAGENTS AND THE DEVELOPMENT OF AN IMPROVED METHOD,
Water Research Association, Marlow (England).
W. K. Dougan, and A. L. Wilson.
The Analyst, Vol 99, No 1180, p 413-430, July 1974. 3 fig, 15 tab, 21 ref.

Descriptors: *Aluminum, *Water analysis, *Analytical techniques, *Pollutant identification, Water properties, Trace elements, Fluorides, Colorimetry, Chemical analysis.
Identifiers: Chromogenic reagents, Color reactions.

The properties of chromogenic reagents used for the absorptiometric determination of Al in water are compared, notably catechol violet, Eriochrome cyanine R, and stilbazo. Catechol violet is considered to be the most suitable, and a method involving the use of this reagent has been developed. The standard deviation of analytical results varied from 0.004 to 0.008 mg/liter of Al for concentrations of 0.05 and 0.03 mg/liter of Al, respectively. With the exception of fluoride, substances normally present in treated waters did not cause important interference. The effect of fluoride (1 mg/liter or less) is tolerable for most purposes, but appreciably greater concentrations require preliminary removal of fluoride or correction for its effect. Satisfactory results were obtained with the method in 6 other laboratories. Ten samples can be analyzed in approximately 1.5 hr. The method has advantages over other commonly used methods, and is recommended for use in water analysis laboratories. (Witt-IPC)
W75-01272

THE USE OF CHITOSAN COLUMNS FOR THE REMOVAL OF MERCURY FROM WATERS,
Ancona Univ. (Italy). Faculty of Medicine.
R. A. A. Muzzarelli, and R. Rocchetti.
Journal of Chromatography, Vol 96, No 1, p 115-121, Aug 28, 1974. 4 fig, 2 tab, 25 ref.

Descriptors: *Mercury, *Pollution abatement, *Water analysis, *Separation techniques, *Analytical techniques, Water properties, Trace elements, Spectrometers, Radiochemical analysis, Toxins, Pollutants, Metals, Inorganic compounds, Absorption, Water quality control, Water pollution control, Carbohydrates, Monitoring, *Chelation.
Identifiers: *Chitosan.

Chitosan is a natural chelating polymer that has been proposed for use in inorganic chromatography for the prevention and survey of pollution by toxic metals. Its application to the removal of ionic mercury from waters is described. Columns containing 1-15 g of chitosan were used to lower the mercury concentration from 1.0 to 0.02 ppm, with volume reduction factors of 2000 to 10,000. Recycling of the columns was carried out with 10 millimoles of KI solution. Elution can also be performed with KCN solution, but is less widely applicable. Elution with sulfuric acid is satisfactory only for the first cycle of unused chitosan. The analytical instrumental techniques employed were flameless atomic absorption spectrometry and radiochemistry. (Witt-IPC)
W75-01273

EXTRACTION OF GUAIACOL FROM AQUEOUS SOLUTIONS (EKSTRAKTSIYA GVAYAKOLA IZ VODNYKH RASTVOROV),
For primary bibliographic entry see Field 5D.
W75-01286

METAL COMPLEXES OF COMPONENTS OF YELLOW ORGANIC ACIDS IN WATER,
New Hampshire Univ., Durham. Water Resource Research Center.
J. H. Weber.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 517, $3.25 in paper copy, $2.25 in microfiche. Completion Report (1973). 20 p, 1 fig, 4 tab, 20 ref. OWRT A-022-NH(1). 14-31-0001-3229.

Descriptors: *Chelation, *Heavy metals, Oxidation reduction potential, Iron, Compounds, Organic compounds, *Organic acids, Ions, *Fulvic

acids, Humic acids, *New Hampshire, Soil analysis, *Pollutant identification, Podzols.
Identifiers: Yellow organic acids, Metal ions, Metal complexes, Oyster River(NH).

Many rivers in New Hampshire are rich in dark brown organic matter from natural sources. Because the interactions between metal ions like Fe3+ and the organic fulvic and humic acids make water treatment difficult, the nature of these metal complexes being studied. One study involves the synthesis of model metal complexes. Fulvic acid was isolated from the B2 horizon of a Podzal soil obtained at Conway, N.H. and fulvic and humic acids were isolated from the Oyster River, (Lee, N.H.). The method of isolating the organic matter from water involves new techniques. The oxygen-containing functional groups carbon, hydrogen, and nitrogen were analyzed for all samples. The fulvic acid and humic acid samples isolated from water are different from each other, but similar to analogous soil samples.
W75-01331

EVALUATION OF CRITERIA FOR DETERMINING LIMITING NUTRIENTS IN SURFACE WATERS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
J. C. O'Shaughnessy.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 523, $7.00 in paper copy, $2.25 in microfiche. PhD. Thesis, 176 p, August 1973. 26 fig, 23 tab. OWRT A-020-PA(1). 14-31-0001-3838.

Descriptors: *Nitrogen, *Phosphorus, Surface waters, Aquatic plants, *Algae, Sediments, *Bioassay, *Connate water, Absorption, *Rooted aquatic plants, *Nutrient requirements, *Pollutant identification, Plant growth.
Identifiers: Alkaline phosphatase enzyme, Ortho phosphorus, Macrophytes, *Ammonia nitrogen.

The effectiveness of different test procedures in describing limiting nitrogen and phosphorus conditions are evaluated, limiting values were established for these tests; and procedures were recommended which may be followed to determine if nitrogen or phosphorus is limiting plant growth in surface waters. Rooted aquatic plants and algae were tested continuously for a two year period for their NH4-N absorption rate, alkaline phosphatase enzyme activity, extractable surplus phosphorus content, and nitrogen and phosphorus tissue content. Surface and sediment interstitial waters and sediments were tested for nitrogen and phosphorus concentrations. Results indicated that the tested bioassay procedures were effective in defining the nutrient status of aquatic plants sampled in site. Threshold concentrations for limiting conditions were established for each of the procedures studied. For the test sites sampled algae became phosphorus limited at streamwater ortho-phosphorus concentrations of less than 0.01 mg P while rooted aquatic plants sampled at similar locations indicated no such deficiency. The significance of sediment-interstitial nutrient supplies for the growth of aquatic macrophytes was demonstrated.
W75-01332

LOWCON - AN INSTRUMENT FOR CONTINUOUS MEASUREMENT OF LOW FIBER CONCENTRATIONS. PART I. PRINCIPLE OF MEASUREMENT (LOWCONEIN GERAET ZUR KONTINUIERLICHEN MESSUNG NIEDRIGER FASERKONZENTRATION. TEIL I: PRINZIP DER MESSUNG),
W. Wendiggensen.
Der Papiermacher, Vol 23, No 1, p 5-8, Jan 19, 1974. 6 fig, 1 tab.

Descriptors: Aqueous solutions, Suspended solids, *Pollutant identification, *Water analysis, *Fibers(Plant), *Monitoring, *Optical properties, *Instrumentation, *Pulp wastes, Pigments, *Measurement.
Identifiers: Lowcon consistency meter.

A photoelectric instrument, 'Lowcon', for continuously monitoring the consistency (fiber concentration) of pulp suspensions is described and illustrated. The apparatus is especially suited for measuring dilute suspensions of solids (below 1%). Its measuring principle involves the optical birefringence of the crystalline portion of cellulosic fibers and its effect on a polarized light source. Results obtained are somewhat affected by the amount of filler pigments present, but the instrument can compensate for this interference. (See also W75-01374) (Speckhard-IPC)
W75-01373

LOWCON - AN INSTRUMENT FOR CONTINUOUS MEASUREMENT OF LOW FIBER CONCENTRATIONS. PART II. MEASUREMENT OF THE FIBER CONTENT IN PULP AND PAPER MILL EFFLUENTS (LOWCON - EIN GERAET ZUR KONTINUIERLICHEN MESSUNG NIEDRIGER FASERKONZENTRATION. TEIL II: MESSUNG DES FASERGEHALTES IM ABWASSER VON ZELLSTOFF- UND PAPIERFABRIKEN),
W. Wendiggensen.
Der Papiermacher, Vol 23, No 2, p 23-27, Feb 16, 1974. 10 fig, 1 tab, 5 ref.

Descriptors: *Water analysis, *Pollutant identification, *Monitoring, *Instrumentation, Suspended solids, *Fibers(Plant), *Optical properties, *Pulp wastes, Pigments, Aqueous solutions, *Measurement.
Identifiers: Lowcon consistency meter.

The practical application of the Lowcon consistency meter-monitor to suspended solids measurements in pulp and paper mill effluents (white water, groundwood mill screen waters, etc.) is illustrated and analyzed. Some precision problems were encountered, owing to interference from nonfibrous solids (such as filler pigments), the effects of varying fiber dimensions, and zero-concentration signals. Some of these error sources will be compensated for in modernized instrument versions. (See also W75-01373) (Speckhard-IPC)
W75-01374

ARSENIC IN WATER BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
K. C. Tam.
Environmental Science and Technology, Vol 8, No 8, p 734-736, Aug 1974. 1 fig, 2 tab, 16 ref.

Descriptors: *Arsenic compounds, *Water analysis, *Pollutant identification, Water properties, Trace elements, *Analytical techniques, *Spectrophotometry, Natural streams, Toxins, Pollutants, Organic compounds, Ultraviolet radiation.

Arsenic in water is extracted with diethylammonium diethyldithiocarbamate in carbon tetrachloride and determined by atomic adsorption spectrophotometry using the carbon rod atomizer. The method will determine arsenate, arsenite, and any organoarsenic compounds soluble in carbon tetrachloride. By using ultraviolet photooxidation to decompose organoarsenic compounds, the method determines total arsenic. Precision is plus or minus 0.4 microgram/liter at 3.1 micrograms/liter, and the detection limit is 1 microgram/liter. (Witt-IPC)
W75-01375

A ROUTINE METHOD FOR THE DETERMINATION OF ARSENIC IN PLANTS, SEDIMENTS, AND NATURAL WATERS,
Department of Scientific and Industrial Research, Palmerston North (New Zealand).
P. F. Reay.
Analytica Chimica Acta, Vol 72, No 1, p 145-154, Sept 1974. 7 tab, 22 ref.

Descriptors: *Arsenic compounds, *Water analysis, *Separation techniques, *Analytical techniques, Chemical precipitation, Molybdenum, Photometry, Chemical analysis, Trace elements, Water properties, Sediments, Plant tissues, *Pollutant identification.
Identifiers: Molybdenum blue.

Coprecipitation with molybdenum sulfide in 2-molar HCl solution is proposed for the recovery of microgram amounts of As from solutions prepared by ashing plants and sediments, and from natural waters. After dissolution of the sulfide precipitate, As is determined photometrically by a molybdenum blue method. The overall recovery for the procedure is 99%. Arsenic was determined in solutions of plant ash at the 2 microgram level with a coefficient of variation of 0.6%. (Witt-IPC)
W75-01376

SPECTROSCOPIC METHOD FOR THE QUANTITATIVE DETERMINATION OF PULP IN ACTIVATED SLUDGE (SPEKTROSKOPICHESKII METOD KOLICHESTVENNOGO OPREDELENIYA TSELLYULOZY V AKTIVNOM ILE),
Vsesoyuznyi Nauchno-Issledovatel'skii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
I. Yu. Levdik, M. V. Maidanovich, S. S. Stroev, and M. D. Inshakov.
Cellulose Chemistry and Technology, Vol 8, No 2, p 167-173, March-April 1974. 2 fig, 2 tab, 6 ref. English summary.

Descriptors: *Pollutant identification, *Pulp wastes, *Activated sludge, *Analytical techniques, *Spectroscopy, *Spectrophotometry, Fibers(Plant), Biodegradation, Oxidation, Biological treatment, Waste treatment, Monitoring.

A method for determining pulp fiber residues in activated sludge is proposed, which is suitable for rapid evaluations of biochemical oxidation rates in the biological treatment of pulp mill effluents. The spectroscopic method is based on the measurment of optical densities of two infrared absorption bands, one at 1320 cm(-1) being due to the pulp cellulose, the other at 1230 cm(-1) being largely due to the activated sludge. The ratio if these two densities indicates the percentage of pulp, using a calibration curve in which light-scattering has been taken into account. The experimental error does not exceed 1% at pulp residuals between 1 and 15%. A single determination requires 30-40 min. (Stapinski-IPC)
W75-01378

AUTOMATED ATOMIC ABSORPTION DETERMINATION OF ARSENIC, ANTIMONY, AND SELENIUM IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington, (Ontario).
P. D. Goulden, and P. Brooksbank.
Analytical Chemistry, Vol 46, No 11, p 1431-1436, Sept. 1974. 4 fig, 3 tab, 8 ref.

Descriptors: *Arsenic compounds, *Water analysis, *Pollutant identification, *Analytical techniques, Spectrophotometry, Chemical analysis, Trace elements, Water properties, Toxins, Inorganic compounds.
Identifiers: *Antimony, *Selenium, Antimony compounds, Selenium compounds, Carcinogens, Hydrides.

A method is described for the determination of submicrogram levels of Sb, As, and Se in natural waters. Stibine (antimony hydride), arsine (arsenic hydride), and hydrogen selenide are produced from the samples in an automated system and passed to a tube furnace mounted in the light path of an atomic absorption spectrophotometer. The use of a tube furnace as a covalent hydride decomposition device gives an increase in sensitivity over a conventional hydrogen/argon-entrained air flame of at least two orders of magnitude. The method will analyze 40 samples an hr with a limit of detection of 0.1 microgram/liter for As and Se and 0.5 microgram/liter for Sb. With a dual-channel spectrophotometer, simultaneous determinations of As and Se have been made on a large number of natural water samples.
W75-01383

WATER-SOLUBLE HYDROCARBONS FROM CRUDE OIL,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
For primary bibliographic entry see Field 5B.
W75-01422

CANCEROUS DISEASE OF PORPHYRA TENERA AND ITS CAUSES,
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
S. Ishio, T. Yano, and H. Nakagawa.
Proceedings of the VIIth International Seaweed Symposium, University of Tokyo Press, pp 373-376, 1972. 3 ref, 1 tab, 5 ref.

Descriptors: *Bottom sediments, *Algae, *Plant diseases, Methodology, Analytical techniques, Laboratory tests, *Pollutant identification, Spectroscopy, Chemical analysis, Bioindicators.
Identifiers: *Carcinogens, *Porphyra tenera, Chloroanthaquinone.

A carcinogenic substance isolated from bottom muds near the mouth of the Ohmuta River that caused cancers on the edges of leaves of Porphyra tenera was confirmed to be 2-chloroanthaquinone, and another compound which induced cancers all over the leaves of the same alga was presumed to be dibenzanthrone reduced forms. The carcinogenic power of these two compounds was compared with that of 3,4-benzopyrene and 9.10-dimethyl 1,2-benzoanthracene. (Katz)
W75-01427

ABSORPTION FROM THE AMBIENT WATER AND COMBUSTION OF ETHANOL IN YOUNG ATLANTIC SALMON (SALMO SALAR L.) AT DIFFERENT TEMPERATURES,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5C.
W75-01501

MULTIRESIDUE METHOD FOR THE DETERMINATION OF TRIAZINE HERBICIDES IN FIELD-GROWN AGRICULTURAL CROPS, WATER, AND SOILS,
CIBA-GEIGY Ltd., Basel (Switzerland). Agrochemical Div.
K. Ramsteiner, W. D. Hoermann, and D. O. Eberle.
J Assoc Off Anal Chem. Vol 57, No 1, p 192-201, 1974. Illus.
Identifiers: Agriculture, Alfalfa, *Pollutant identification, Ametryne, Atratone, Atrazine, Butylamino-2-Chloro-6-Ethylamino-S, Butylamino-4-Ethylamino-6-Methoxy-S, Cereal, Chromatography, Crops, Desmetryne, Fruit, *Gas chromatography, Grass, Grown, *Herbicides, Metoprotryne, Potato, Prometone, Prometryne, Propazine, Simazine, Soils, Straw, Terbutryne, Triazine, Vegetables.

A gas chromatographic multiresidue method is described for the following triazine herbicides: ametryne, atratone, atrazine, desmetryne, metoprotryne, GS-13529 (4-tert-butylamino-2-chloro-6-ethylamino-S-triazine), GS-14254 (2-sec-butylamino-4-ethylamino-6-methoxy-s-triazine), terbutryne, prometone, prometone, prometryne, propazine and simazine. The method consists of a methanol extraction, clean-up on an alumina column and determination on a Carbowax column with N-, S- and Cl-specific detectors. Extraction and recovery data are given. Water, soil, fruits, vegetables, cereals, alfalfa, grass, potato tubers and straw are analyzed.--Copyright 1974, Biological Abstracts, Inc.
W75-01503

CONTINUOUS AUTOMATED MEASUREMENT OF RATES OF PHOTOSYNTHESIS AND RESPIRATION IN AN UNDISTURBED RIVER COMMUNITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
M. G. Kelly, G. M. Hornberger, and B. J. Cosby.
Limnology and Oceanography, Vol 19, No 2, p 305-312, 1974. 3 fig, 1 tab, 21 ref. NSF GB 32914.

Descriptors: *Measurement, *Photosynthesis, *Respiration, *Rivers, Automation, Productivity, Oxygen, Mathematical studies, Diurnal, Light, Fourier analysis.

An exact solution has been used of the oxygen mass-balance equation and oxygen data from two stations in a river to calculate a continuous function (a Fourier series) describing variation of net community production in a river segment over a day. Used with automated digital data collection and processing, the method gives net community productivity for all times during the day rather than at discrete times. The method is shown to be accurate and allows estimation of community respiration, gross productivity, and relative phosynthetic efficiency. Modifications can be used successfully with inorganic carbon, with free measurements in standing waters, and in benthic chambers. It should have practical applications for water quality monitoring. The community respiration includes the effects of biological oxygen demand due to allochthonous materials and thus the effects of BOD loading changes can be directly observed. Also, since the productivity of river communities is sensitive to nutrient input, photosynthetic efficiency would be raised by an increased nutrient input, and the effect of nutrient pollution could be followed. The Fourier series is well suited as input to the models of river oxygen balance commonly used for abatement planning. (Jones-Wisconsin)
W75-01505

DETERMINATION OF WATER QUALITY PARAMETERS IN THE MASSACHUSETTS BAY (1970-1973),
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-01511

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, and V. E. Smith.
Available from the National Technical Information Service, Springfield, Va. 22161, as N73-29247, $8.00 in paper copy, $2.25 in microfiche. Report No BSR 4089, August 1973. 118 p, 84 fig, 11 tab, 7 ref, 2 append.

Descriptors: *Monitoring, *Eutrophication, *Technology, *Satellites(Artificial), Size, Reflectance, Depth, Shallow water, Algae, Scum, Floating plants, Color, Spectroscopy.
Identifiers: *ERTS-1.

Feasibility of Earth Resources Technology Satellite-1 as a broad survey monitor in measuring state of eutrophication of inland lakes is demonstrated. Significant findings are (a) one-acre lakes and one-acre islands are detectable, (b) removal of atmospheric parameters derived from Radiant Power Measuring Instruments (RPMI) show test lakes to have reflectances of 3.1 to 5.5% in band 4 and 0.3 to 2.3% in band 5, (c) failure to remove reflectance caused by atmosphere results in errors up to 500% in computing lake reflectance from ERTS data, (d) in band 4, up to seven reflectance levels were observed, (e) these reflectance patterns have been displayed on a color-coded TV monitor and on computer--generated gray scales, (f) deep and shallow water can be separated; estimates of water depth may be possible, (g) the RPMI provide direct spectral signature measurements, i.e., algal scums, floating plants, etc., (h) a method is reported for obtaining lake color from ERTS data, (i) a strong correlation between browner water color, diminishing water transparency, and increasing particulate carbon and algal diversity is observed, (j) classifying lake eutrophication by observation of surface scums or macrophytes in shallow water presents no ambiguity. (Jones-Wisconsin)
W75-01515

DETERMINATION OF MERCURY FROM LAKE SEDIMENTS,
National Swedish Environmental Protection Board, Uppsala. Limnological Survey.
L. Hakanson, and R. Uhrberg.
Vatten. 29(4): 444-450, Illus. 1973.
Identifiers: Lakes, *Mercury, Samples, *Spectroscopy(Atomic absorption), *Pollutant identification, *Lake sediments.

Determination of the Hg content of lake sediments requires a total analytical approach. A good sampling method, a relevant sedimentological knowledge, and a tested analytical technique are needed to achieve significant results. The Hg found in lake sediments is predominately absorbed by organic particles. Comparatively little Hg is found in the interstitial water, nor is much adsorbed by inorganic materials. A new sample preparation method for analysis of Hg with flameless atomic absorbtion is introduced. This sample preparation gives a cheaper and faster analysis compared to previous methods, with an equivalent accuracy.--Copyright 1974, Biological Abstracts, Inc.
W75-01598

POSSIBILITIES OF THE 'CARBON ROD' TECHNIQUE FOR THE DETERMINATION OF TRACE ELEMENTS IN WATER BY ATOMIC ABSORPTION,
Rijksfaculteit der Landbouwwetenschappen, Ghent (Belgium).
M. Verloo, and L. Kiekens.
Meded Fac Landbouwwet Rijksuniv Gent, Vol 38, No 1, p 81-92, 1973, Illus.
Identifiers: Atomic absorption, *Carbon rod technique, *Trace elements, Water analysis, *Pollutant identification.

Comparing flame atomic absorption with the carbon-rod technique, the latter method represents a largely increased sensitivity (7-75 times) so that the analysis of trace elements in water needs no more preconcentration. The repeatability varies between 4-7% which is still sufficient at this low concentration level. However the application of this micro-technique and especially the manipulation of the micro-syringe needs sufficient precautions to avoid any contamination.--Copyright 1974, Biological Abstracts, Inc.
W75-01619

INSTRUMENTATION FOR WATER QUALITY MONITORING,
California Univ., Berkeley. Lawrence Berkeley Lab.

S. L. Phillips, D. A. Mack, and W. D. Macleod.
Anal Chem, Vol 46, No 3, p 345A-356A, 1974, Illus.
Identifiers: Cadmium, Cyanide, *Instrumentation, Mercury, Monitoring, Pesticides, Pollution, Saline, Waste water, Water quality, Toxicity, Toxic chemicals, *Pollutant identification.

Instruments which are useful in measuring the quality of fresh, waste and saline waters are surveyed. These instruments include continuous samplers, semi-continuous samplers, semi-continuous samplers and laboratory analyzers. Instrumental techniques employed for determining contaminants included in the Environmental Protection Agency list of toxic pollutants (e.g., Cd, Hg, cyanide, pesticides) and turbidity are discussed in detail. An ideal instrument is described.--Copyright 1974, Biological Abstracts, Inc.
W75-01620

PRACTICAL ANALYSIS OF CYANIDE ION IN INDUSTRIAL WASTE WATER, (IN JAPANESE),
Tokyo Metropolitan Research Lab. of Public Health (Japan).
F. Kuriyagawa, A. Okuzawa, and S. Matsumoto.
J Hyg Chem. 19(2): 110-116, Illus. 1973. English summary.
Identifiers: *Colorimetry, *Cyanide ion, *Industrial waste water, Ions, *Pollutant identification.

A new analytical procedure using a cyanometer in colorimetry was designed. The use of the cyanometer simplifies the steps in analysis, although data obtained from the direct use of the cyanometer with waste water samples was unreliable. The stability of the pyridine-pyrazolone reagent in colorimetry was examined; the mixed reagent solution should not be preserved for more than 1 day. Chlorine, sulfide and sulfite ions have an effect on the cyanide ion, the colorimetry reagents and the function of a cyanometer.--Copyright 1974, Biological Abstracts, Inc.
W75-01621

QUANTITATIVE METHOD FOR ENUMERATING SALMONELLAE IN SURFACE WATERS, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
G. P. Kalina.
Gig Sanit. 38(7): 87-89, 1973.
Identifiers: Methodology, Pollution, Quantitative methods, *Salmonellae, Surface water, Pollutant identification.

For enumerating salmonellae in surface waters, investigation of 1000 ml of water divided into 10 portions of 100 ml each, 1 of which in turn is divided into 10 portions of 10 ml each for a total of 19 portions, with subsequent calculation of the most probable number from a table is recommended. The proposed method permits determining the sanitary-epidemiological condition of the water with a high degree of probability.--Copyright 1974, Biological Abstracts, Inc.
W75-01622

SOME PROBLEMS OF A HYGIENIC INVESTIGATION OF COASTAL WATERS, (IN RUSSIAN),
Azov-Volga-Don Water Health Dept., Rostov-na-Donu (USSR). Basin Sanitary Epidemiological Station.
V. A. Prokopenko, O. L. Davydov, O. V. Mezhera, and Y. M. Khabakhbashev.
Gig Sanit. 38(7): 98-100, 1973.
Identifiers: *Coastal waters, Hygienic studies, Pollution, Water sampling, *Pollutant identification.

When conducting hygienic investigations of coastal waters, it is important to select correctly the sites for observations with consideration of the problem being solved, zones of water use and sources of pollution. Four functional zones of water use should be distinguished: children's bathing zone, adult's bathing zone, area where water is collected for therapeutic baths and swimming pools, and zone used for sporting purposes and fishing. The water samples should be taken under different hydrometeorological conditions (calm and various wind velocities and directions). During the year, 4-5 series of observations should be made, covering the spring, summer and fall. Investigations should be carried out mainly during the bathing season, when the sea is used most by the population.--Copyright 1974, Biological Abstracts, Inc.
W75-01623

DETERMINATION OF ISOPHOS-2 IN WATER BY THIN-LAYER CHROMATOGRAPHY, (IN RUSSIAN),
All-Union Scientific Research Inst. of Chemical Means of Protecting Plants, Moscow (USSR).
K. F. Novikova, F. R. Mel'tser, and S. R. Musamukhamedov.
Gig Sanit. 38(7): 75-76, 1973.
Identifiers: Chlorophenyl-N-Isopropylamidochlorom, *Chromatography, *Herbicide, *Isophos-2, Millet, Phosphonate, Rice, Weeds, *Pollutant identification.

Isophos-2 is a new selective organophosphorus herbicide giving good results in controlling milletlike weeds in rice paddies. Its active principle is 0,2,4-dichlorophenyl-N-isopropylamidochloromethyl thiophosphonate. In pure form isophos-2 is an oily liquid, freely soluble in benzene, alcohol, acetone, chloroform, and ether and poorly soluble in water, but its wide use on rice paddies necessitates methods for checking its residual quantities in water. The method proposed for determining isophos-2 in water is based on extraction of the herbicide from water with chloroform, removal of free phenols by washing with alkali, and chromatography on a thin layer of silica for luminophores in the system hexane: acetone (6:1) or hexane: chloroform (1:1). The spots of isophos-2 are developed with aminoantipyrine. The sensitivity of the method is 1 microgram in the analyzed samples (0.01 mg/l).--Copyright 1974, Biological Abstracts, Inc.
W75-01624

THE PLATEAU B.O.D.--MEASUREMENT AND SIGNIFICANCE (DER PLATEAU-BSB-MESSUNG UND AUSSAGEKRAFT),
Karlsruhe Univ. (West Germany).
L. Hartmenn.
Unwelthygiene, Vol 25, No 5, p 99-102, 1974. 6 fig.

Descriptors: *Measurement, *Biochemical oxygen demand, *Biological treatment, Sewage treatment, Automation, Activated sludge, Waste water(Pollution), Analytical techniques, *Pollutant identification.
Identifiers: *Plateau BOD values, Dissolved organics.

The measurement and significance of the plateau BOD value in waste water are described. The BOD curves are the result of a series of biological reactions. As shown by experiments, only the very first reaction is caused by the aerobic degradation dissolved organic matter. Consequently, only this first reaction has significance for the biological treatment of sewage. This BOD, termed as plateau-BOD, is established in 18 to 24 hrs (or in much shorter time depending on the bacteria count and the temperature). While this plateau-BOD considers the oxygen demand for the primary oxidation elimination of dissolved organic substances, the BOD5 additionally considers endogeneous respiration and other secondary reactions. A new instrument, Pollumax, developed by Pollux, permits the automatic determination of the plateau-BOD value by converting the vacuum into electrical signals. These in turn can be used in control circuits by computer. The automatic measurement of the plateau-BOD values indictes new automation of activated sludge waste water treatment plants. (Takacs-FIRL)
W75-01640

DETERMINATION OF CHROMIUM IN WATER AND WASTE WATER (BESTIMMUNG DES CHROMS IN WASSER UND ABWASSER),
H. Wendel.
Gas-und Wasserfach-Wasser Abwasser, Vol 115, No 5, p 227-229, 1974. 6 ref.

Descriptors: *Chromium, *Waste water(Pollution), *Analytical techniques, *Pollutant identification, Analytical techniques.

Methods for the qualitative and quantitative determination of chromium in waste water are described. For qualitative determination, the evaporation residue is fused with sodium carbonate and potassium nitrate or sodium peroxide. The cold fused mass is dissolved in the acetic acid. Upon addition of silver nitrate, reddish brown silver chromate is obtained. Yellow lead chromate is precipitated by the addition of lead acetate. If the cold fused mass is treated with sulfurous acid and hydrogen peroxide, ether-soluble deep blue chromium peroxide is obtained. For quantitative determination, the fused mass obtained from the evaporation residue is purified and treated with sulfuric acid and phosphoric acid, after which the solution is titrated with 0.1n-ferrous sulfate solution after addition of diphenylamine solution until color shift from violet to green occurs. In another photometric method reddish purple color is obtained by the reaction of chromate ions with diphenylcarbazide in acid solution. (Takacs-FIRL)
W75-01641

DETERMINATION OF THE CHEMICAL OXYGEN DEMAND BY MEANS OF VANADATE SULFURIC ACID (DIE BESTIMMUNG DES CHEMISCHEN SAURSTOFFBEDARFS MITTELS VANADATSCHWEFELSAEURE),
S. Schulze-Rettmer, and G. Straten.
Wasser-und Abwasser-Forschung, Vol 7, No 2, p 57-62, 1974. 2 tab, 26 ref.

Descriptors: *Chemical oxygen demand, *Sulfuric acid, *Water quality control, Oxidation, Analytical techniques, *Pollutant identification.
Identifiers: Vanadate sulfuric acid, Dichromate method, Permanganate method.

Disadvantages of COD determination by dichromate-sulfuric acid, and a new method of COD determination by means of vanadate-sulfuric acid are described. Oxidation of chlorides and disintegration of dichromate are the basic disadvantages of the dichromate method. These disadvantages are eliminated by the use of vanadate-sulfuric acid. For COD determination by this method, mercury sulfate, silver sulfate and sulfuric acid are combined, after which vanadate-sulfuric acid is added for boiling the sample under addition of silver sulfate and sulfuric acid. Then, ammonium ferric sulfate solution and o-phenanthroline indicator are added until color shifts from bluish green to reddish blue. Comparative determinations of COD values of pure organic compounds revealed oxidation rates of 93 percent, 87 percent, and 33 percent for dichromate, vanadate, and permanganate methods, respectively. (Takacs-FIRL)
W75-01642

THE USE OF CHELATING ION EXCHANGE IN CONJUNCTION WITH RADIOISOTOPE X-RAY SPECTROMETRY FOR DETERMINATION OF TRACE AMOUNTS OF METALS IN WATER,
Institute of Nuclear Physics and Techniques, Krakow (Poland).
B. Holynska.

Radiochemistry and Radioanalytical Letters, Vol 17, No 5/6, p 313-324, June 20, 1974. 6 fig, 1 tab, 11 ref.

Descriptors: *Chelation, *Ion exchange, *Trace metals, *Spectrometry, Analytical techniques, Kinetics, Radioisotopes, Fluorescence, Calcium, Sodium, *Pollutant identification.
Identifiers: Resin.

The chelating ion-exchange resin Chelex-100 was applied for collection of trace amounts of several metal ions from aqueous solutions. The kinetics of the exchange reaction has been measured, as well as the influence of pH of the solution and calcium or sodium ions concentrations on the metal collection. The radioisotope X-ray fluorescence method has been applied for determination of metal ions sorbed on the resin. (Prague-FIRL)
W75-01644

GENERALIZATION, TYPIFICATION, AND KINETIC ANALYSIS OF THE BIOCHEMICAL OXYGEN DEMAND CURVES BASED ON BOD-EXPERIMENTS (OBOBSHCHENIYE, TITIZAT-SIYA I KINETICHESKIY ANALIZ KRIVYKH POTREBLENIYA KISLORODA PO DANNYM BPK-OPYTOV),
A. V. Kenov.
Okeanologiya, Vol 14, No 1, p 82-87, 1974. 2 tab, 28 ref.

Descriptors: *Biochemical oxygen demand, *Equations, *Kinetics, Mathematical models.
Identifiers: BOD curves.

The established types of BOD curves are generalized on the basis of published BOD data. The existing types are arbitrarily divided into monophasal and multiphasal curves. Monophasal curves are sinusal or autocatalytic, parabolic and exponential, while among the multiphasal curves, linear curves with terminal acceleration, exponential-autocatalytic, parabolic-linear, exponential-autocatalytic-linear, autocatalytic-linear with terminal acceleration, exponential-linear with terminal acceleration, polyautocatalytic, exponential-linear and autocatalytic-linear types are distinguished. Kinetic equations for the 12 different types of BOD curves are given. (Takacs-FIRL)
W75-01647

5B. Sources Of Pollution

APPEARANCE AND STABILITY OF HYDROLYZED FE(C104)3 SOLUTIONS,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
P. H. Hsu.
Clays and Clay Minerals, Vol 21, p 267-277. 1973, 3 fig, 4 tab, 17 ref. OWRT A-031-NJ(4). 14-01-0001-3230.

Descriptors: *Iron compounds, Hydrolysis, *Ironoxide, Water quality, *Waste water treatment, Kinetics.

Fe(C104)3 solutions of different concentration and acidity were studied to search for the factors governing their appearance and stability during aging and to elucidate the mechanisms for the formation of amorphous and crystalline iron (III) hydroxides from slow hydrolysis. Dilute solutions (0.001 M or lower) rapidly hydrolyzed to clear sols after a brief induction period. With an increase in iron (III) concentration, gradual increases occurred in the induction period, turbidity and particle size. Thus, solutions 0.006M to 0.01M in iron (III) developed into dense, cloudy, yellow suspensions impervious to light. The polymeric iron (III) species in the aged 0.02M solution were primarily large particles that settled under gravity, resulting in a suspension of low turbidity. In dilute solutions, the initial polymerization product was amorphous iron (III) hydroxide which yielded X-ray diffraction peaks for Fe00H only after prolonged aging or not at all. In 0.01 and 0.02M solutions, however, crystalline Fe00H was the major product from the very beginning of polymerization. The results suggest that the initial degree of supersaturation with respect to amorphous iron (III) hydroxide is the key factor governing particle size distribution, which in turn governs the appearance, stability and crystallinity of the hydrolyzed product during aging. This analysis relates to investigations of the basic mechanism of phosphates from water.
W75-01102

ZONES OF NITRIFICATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
T. J. Tuffey, J. V. Hunter, and V. A. Matulewich.
Water Resources Bulletin, Vol 10, No 3, p 555-564, June 1974. 3 fig, 6 tab, 19 ref. OWRT B-027-NJ. 14-01-0001-3030.

Descriptors: *Nitrification, Management, *Biochemical oxygen demand, Water pollution sources, Nitrogen, Ammonia, Nitrites, Nitrates, Nitrogen Cycle, *Water pollution control, Bacteria, Kinetics, Estuaries.
Identifiers: *Nitrosomonas, *Nitrobacter, Bacterial growth kinetics, Nitrifying bacteria.

The hypothesis is advanced that nitrification exists in shallow streams as a result of surface activity and in estuaries due to growth in the water phase. Between these zones no significant levels of nitrification occur. Field measurements of ammonia, nitrite and nitrate nitrogen, enumerations of Nitrosomonas and Nitrobacter, and respirometry on two small streams and two moderately large rivers are presented. The appropriate mathematical models to describe nitrification must be based on the mechanisms involved - bacterial growth kinetics for estuaries and zero kinetics for the surface activity in shallow streams.
W75-01103

OPTIMAL WEIGHTING FUNCTION IN WATER QUALITY MODELING,
University of Southern California, Los Angeles. Dept. of Chemical Engineering; and University of Southern California, Los Angeles. Dept. of Electrical Engineering and Materials Science.
E. S. Lee, and P. K. Misra.
Water Resources Bulletin, Vol 10, No 3, p 447-469, June 1974. 10 fig, 3 tab, 5 ref. OWRT C-3051(No 3678)(1). 14-31-0001-3678.

Descriptors: *Water quality, *Simulation analysis, *Mathematical models, *Optimization, Dissolved oxygen, Biochemical oxygen demand, Equations, Estimating, Least squares method, Systems analysis, Time.
Identifiers: *Weighting function, *Dynamic modeling, Gradient approach, Sequential search technique, Calculus of variations, Convergence rate.

In an earlier paper by Lee and Hwang, (See W71-06587) the invarient imbedding concept was applied to the dynamic modeling of stream quality. In the approach presented herein, a set of weighting functions is introduced. The initial conditions for these weighting functions must be estimated. It has been found that these initial conditions influence the convergence rate tremendously. In many water quality control situations, the number of experimental data points is limited. In order to obtain the best estimates with limited experimental data, the best convergence rate should be used. In this work, the least squares criterion combined with various optimization techniques, including a sequential search technique and a gradient approach, is used to obtain the optimal initial conditions for the weighting functions. The proposed schemes greatly improve the convergence rate. (Bell-Cornell)
W75-01111

EFFECTS OF A POWER PLANT ON ZOOPLANKTON DISTRIBUTION AND ABUNDANCE NEAR PLANT'S EFFLUENT,
Wisconsin Univ., Madison. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-01123

ORGANIC ENRICHMENT WITH LEAF LEACHATE IN EXPERIMENTAL LOTIC ECOSYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W75-01128

EXPERIMENTAL STUDY OF AMMONIFICATION IN AQUATIC ENVIRONMENTS (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
M. Laurent.
Rev Ecol Biol Sol. Vol 10, No 2, p 153-167. 1973. Illus. English summary.
Identifiers: Alfalfa, *Ammonification, *Ammonifying bacteria, Aquatic environment, Bacteria, *Nitrogen, Oaks, Soils, *Decomposing organic matter.

Decomposition of organic matter in aquatic environments was studied experimentally. Ammonification is considered from a chemical and microbiological aspect. Powdered alfalfa and oak leaf were mixed with mud in the tanks; then the variations in the number of ammonifying bacteria and in the total and mineral N content are measured. Balances are established in the tanks. Ammonification occurs in both the muds and soils in the same manner. Its values are highest when the added substance has a low C/N ration. Balances show that, considering the low quantity of mineral N recovered, addition of organic N can be profitable only under certain conditions.--Copyright 1974, Biological Abstracts, Inc.
W75-01132

WATER QUALITY MONITORING ON THE MISSISSIPPI RIVER HAS ITS PITFALLS,
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 5A.
W75-01139

QUALITY OF LOCAL LAKES AND STREAMS IN THE LAKE WASHINGTON AND GREEN RIVER DRAINAGE BASINS,
Municipality of Metropolitan Seattle, Wash.
C. M. Whitmore, R. G. Swartz, R. N. Brenner, and G. D. Farris.
December 1973. 99 p, 5 fig, 18 tab, 10 ref.

Descriptors: *Water quality, *Surveys, *Lakes, *Streams, *Sampling, Eutrophication, Nutrients, Planning, River basins, Comprehensive planning, On-site data collections, Baseline studies.
Identifiers: *Lake Sawyer, *Lake Washington, *Sammamish River, Seattle.

A preliminary water quality sampling survey was initiated on 34 lakes and 37 streams in King and lower Snohomish Counties as part of the river basin planning program. This preliminary survey conducted over a period of one year was designed to determine the existence of any major water quality problems and the need for more detailed study. In general, most lakes and streams sampled had either poor sanitary quality, or high nutrient levels conducive to eutrophic conditions, or both. Fifteen of the lakes sampled were in some stage of eutrophication, eleven were mesotrophic, three were dystrophic and one was unclassified. At least 11 of the 34 lakes had serious water quality problems (either natural or man-related); and sewerage service and better conservation of local watershed resources were considered necessary for their improvement. Lake Sawyer appeared to

be improving because of increased flushing, and several of the other lakes were in acceptable to good condition. The tested stream systems also ranged considerably in quality. Tributaries of the north end of Lake Washington and the Sammamish River were in decidely poorer condition than the other stream systems, and a need for further monitoring and pollution control measures was indicated. (Poertner)
W75-01140

MERCURY IN WATERS OF THE WESTERN UNITED STATES,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. A. Jenne.
In: Proceedings of workshop on Mercury in the Western Environment; D. R. Buhler, editor: Oregon State University Department of Continuing Education Publication, Corvallis, p 16-28, 1973. 4 fig, 1 tab, 17 ref.

Descriptors: *Mercury, *Water pollution sources, Heavy metals, Water analysis, Streams, Surface waters, Waste water(Pollution).

The natural background of Hg in freshwaters is probably not more than 0.05 ppb in nonmineralized areas. Mercury concentrations in major United States streams are commonly less than 0.1 ppb but may reach 0.5 ppb or more below major industrial sources of contamination or near mercury deposits. Although the mercury content of surface waters in the West is generally lower than that found for the entire United States, high concentrations of mercury are found in a number of locations. The occurrence of these high mercury levels in Western waters appears to be more closely associated with the natural occurrence of mercury in the rocks of that region than with the industrial discharge of mercury. (Knapp-USGS)
W75-01166

QUALITY OF PUBLIC WATER SUPPLIES OF NEW YORK, NOVEMBER 1970-APRIL 1972.
Geological Survey, Albany, N.Y.
Open-file report, 1974. 198 p, 8 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Water supply, *Potable water, *New York, Water analysis, Water treatment, Public health, Sampling.

This report is the first in a planned series to present the analytical results for samples collected in a continuting program to examine the quality of water of public supplies in the State of New York. The continuing program is designed to examine periodically each of the approximately 1,500 public supplies in the State. Major supplies and those known or found to have problems will be sampled more frequently than minor supplies. During the period covered in this report, November 1970 to April 1972, samples were collected from 399 public water supply systems. A total of 881 samples was collected: 342 raw-water samples, 316 treated-water samples, and 223 distribution-system samples. Paired raw and treated samples were collected from 315 selected systems. During the report period, water of 44 systems was sampled from two to six times. (Knapp-USGS)
W75-01170

RADIOCHEMICAL MONITORING OF WATER AFTER THE CANNIKIN EVENT, AMCHITKA ISLAND, ALASKA, AUGUST 1973,
Geological Survey, Denver, Colo.
W. C. Ballance.
Available from NTIS, Springfield, Va. 22161, as USGS-474-205, $4.00 in paper copy, $2.25 in microfiche. U S Atomic Energy Commission, 1974. 20 p, 3 fig, 4 tab, 6 ref. AEC Agreement AT(29-2)-474.

Descriptors: *Monitoring, *Nuclear explosions, *Radioactive wastes, *Tritium, *Alaska, Water pollution sources, Path of pollutants, Nuclear wastes.
Identifiers: *Amchitka Island(Alaska).

Water quality was monitored on Amchitka Island, Alaska, after three underground nuclear detonations in 1973. Water sampling and analyses begun in 1965 established natural levels of radioactivity of different sources of water. Tritium determinations were made on 86 samples. Gross alpha and gross beta/gamma determinations were made on 38 samples. The range of data for these samples was equal or less than the range of values obtained before the Cannikin event. (Knapp-USGS)
W75-01172

PHOSPHORUS INPUTS FROM THE ATMOSPHERE,
DePaul Univ., Chicago, Ill. Dept. of Chemistry.
T. J. Murphy, and D. J. Cesarotti.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 341, $3.25 in paper copy, $2.25 in microfiche. Paper presented at 37th Annual Meeting of the American Society of Limnology and Oceanography, Seattle, Washington, June 27, 1974, 20 p, 10 fig, 37 ref. OWRT A-065-ILL(1). 14-31-0001-4013.

Descriptors: Precipitation(Atmospheric), *Phosphates, *Phosphorus, Atmosphere, Washouts, *Air pollution, *Illinois, *Lake Michigan, Water pollution sources, *Path of pollutants.
Identifiers: *Chicago(Ill), *Orthophosphates.

The precipitation scavenging of phosphorus from the atmosphere is shown to contribute 0.25 kg/ha/yr of total phosphorus in the Chicago area. Of this, 0.09 kg/ha/yr is in the form of ortho phosphate. These inputs are compared to inputs of phosphorus to Lake Michigan and to the inputs of phosphorus determined elsewhere by others. Some possible sources of this phosphorus to the atmosphere are evaluated and no large local source is identified. Finally, the inputs in a remote area, Beaver Island, were also determined and compared to the inputs in Chicago. It is concluded from these data that as much as 36% of the phosphorus going into the southern part of the Lake and 23% going into the northern part is coming from the atmosphere. This is being distributed over the whole surface of the Lake and a significant portion is the biologically available ortho phosphate.
W75-01199

NATURE OF ORGANIC DERIVATIVES OF SELECTED TOXIC METALS IN NATURAL WATERS,
Wisconsin Univ., Madison. Water Chemistry Program.
D. W. Hendrickson, D. E. Armstrong, G. D. Veith, and G. E. Glass.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 339, $3.75 paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 74-07, 1974. 20 p, 5 fig, 1 tab, 34 ref. OWRT A-047-WIS(1). 14-31-0001-3550, 14-31-0001-3850.

Descriptors: *Cadmium, *Chromium, *Copper, *Mercury, *Zinc, Natural streams, *Organic compounds, *Wisconsin, *Metals, Lakes, Chromatography, Organic matter, Water pollution sources, Toxicity, Ions, Analytical techniques.
Identifiers: *Lakes Mary(Wisc), Vilas County(Wisc).

The apparent complexation (termed association) of Cd(II) with organic matter isolated from Lake Mary, Vilas County, Wisconsin, was investigated. Gel permeation chromatography (GPC) was evaluated for separation of free and organic matter associated metal to allow computation of association constants. Cd(II) was equilibrated with the organic matter and the Cd-organic matter mixture was eluted through Sephadex G-25 columns with a Cd(II) solution of the same Cd concentration as the initial equilibration solution. The organic-associated Cd was eluted from the column more rapidly than the free Cd(II) allowing evaluation of the equilibrium free and organic associated Cd(II) concentrations. Plots of Cd(II) bound versus organic matter concentration and Cd(II) bound versus free Cd(II) concentration were linear suggesting that a 1:1 Cd-organic matter 'complex' was formed. Evaluation of organic matter from other sources and of other metal ions are continuing.
W75-01201

PENETRATION AND MIXING OF HEATED JETS INJECTED INTO WATERWAYS WITH APPLICATION TO THE THERMAL POLLUTION PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
J. A. Schetz.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 337, $3.25 in paper copy, $2.25 in microfiche. Completion Report, December 1973. 12 p, 3 fig, 4 ref. OWRT B-041-VA(5).

Descriptors: *Thermal pollution, *Hydraulic models, *Heated water, Laboratory tests, *Path of pollutants, Water temperature, Spatial distribution, Approximation method, Numerical analysis, Mixing, Jets, Turbulent flow, Channels.
Identifiers: *Jet mixing, Turbulent jet flows.

Results of a theoretical and experimental study of the development of the three-dimensional mizing zone produced by a heated discharge from a jet into a waterway were presented. An integral approach with a control volume was used and the equations of conservation of mass, momentum, and energy were applied to this control volume. A detailed numerical computer solution of differential equations was outlined. The approximate method when compared with experimental results predicted relatively well the cross-stream jet penetration for the highest and lowest velocity ratio cases. In general, the effects of buoyancy forces as manifested by the curvature of the jet trajectory out of the horizontal injection plane was underestimated. Although comparison of the center of an experimental dye trace and computed temperature profiles was not direct, it appeared that the numerical solution slightly underestimated the jet penetration across the waterway stream and toward the surface. However, the major features of the flow field were well predicted. (Humphreys-ISWS)
W75-01203

AN ANALYTICAL AND EXPERIMENTAL STUDY OF COMBINED CONDUCTION-RADIATION ENERGY TRANSFER IN STAGNANT WATER,
Purdue Univ., Lafayette, Ind. Heat Transfer Lab.
For primary bibliographic entry see Field 2H.
W75-01206

THE SELF-DIFFUSION COEFFICIENTS OF 45CA AND 2,4-DICHLOROPHENOXYACETIC ACID,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01233

EFFECT OF PORE SIZE ON DIFFUSION COEFFICIENTS IN POROUS MEDIA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01234

SOURCES OF NITROGEN AND PHOSPHORUS IN THE LAKE GEORGE DRAINAGE BASIN: A DOUBLE LAKE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
D. B. Aulenbach, and N. L. Clesceri.
In: Realism in Environmental Testing and Control, Proceedings 19th Annual Technical Meeting, April 2-5, 1973, Anaheim, California, p 424-431, (1973). 3 fig, 4 tab, 21 ref, (Fresh Water Institute Report 73-1 and International Biological Program Contribution No 59). OWRR C-2209(No 3387)(2).

Descriptors: *Eutrophication, *Nutrients, *Nitrogen, *Phosphorus, Lakes, *New York, Analysis, Precipitation(Atmospheric), Waste water(Pollution), Runoff, Water pollution sources, Sewage effluents, Fertilizers, Septic tanks, Water pollution effects.
Identifiers: *Lake George(NY), South Lake George(NY), North Lake George(NY).

Lake George, New York, is divided into two basins essentially equivalent to two major lakes, similar in physical characteristics. To evaluate potential for producing algal growth, measurements of nitrogen and phosphorus in the two basins and identification of the nutrient sources were made. The only facet in which the two lakes differ appreciably is in the amount of runoff which is considerably greater to South Lake George than to North. The stress on South Lake George is due to human habitation since the permanent year-round population is approximately four times that of the North L. G. Of the total nitrogen added to Lake George every year, 61% is added to the southern basin, mainly contributed by precipitation. Of all the phosphorus added, 82% is added to South L. G. and 18% to North L. G. Despite the fact that over four times as much phosphorus is added to South L. G., the total amount of phosphorus in the water is only slightly greater than that in North L. G. Thus some mechanism for phosphorus removal is apparently active within the lake itself. (Jones-Wisconsin)
W75-01235

BIOACCUMULATION AND TRANSFER OF 14C-DDT IN A SMALL POND ECOSYSTEM,
Helsinki Univ. (Finland). Dept. of Zoology.
H. A. Vaajakorpi, and L. Salonen.
Ann Zool Fenn, Vol 10, No 4, p 539-544, 1973, Illus.
Identifiers: Adipose, *Bioaccumulation, *Carbon-14, Carp, Crucian, *DDT, Drepanocladus-sp, *Ecosystem, Gill, Invertebrates, Liver, Muscle, Newt, Perch, Ponds, Sphaerium lacustre, Tissue, Utricularia minor, *Path of pollutants.

14C-Labelled DDT (500 mg) with inactive carrier DDT was pumped into a small (500 cu m) polyhumous pond. During the next 2 mo., bioaccumulation and transfer of DDT were observed in filtered water suspended material, sediment, 2 fish species, newt, 4 aquatic invertebrates and 2 plant species. DDT was determined quantitatively by liquid scintillation counting. An applied combustion technique was used on all samples except filtered water before transfer into the scintillating liquid. Suspended material rapidly bound DDT from the water (ca. 7% of the total amount added). In perch accumulation was rapid in the liver, but the concentration soon decreased again, indicating reactivity of the tissue. In mesenteric adipose tissue, the concentration increased throughout the test period, being 23.8 ppm at the end of the period, i.e., distinctly higher than the maxima reached in other tissues (liver 16.1, gills 3.7 and muscle 0.4 ppm). In crucian carp the concentrations were lower than in perch. Among invertebrates the highest concentration (3.0 ppm) was found in Sphaerium lacustre. The concentrations measured in Utricularia minor were 7-fold those in Drepanocladus sp. Apparently, redissolution occurred from sedimentto water, the concentration thus remaining relatively stable to the end of the test period.--Copyright 1974, Biological Abstracts, Inc.
W75-01236

ZINC, CADMIUM, COPPER AND MANGANESE IN SPECIES OF FINFISH AND SHELLFISH CAUGHT IN THE DERWENT ESTUARY, TASMANIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W75-01243

THE OCCURRENCE OF NITRATE IN GROUNDWATER,
South Australia Engineering and Water Supply Dept., Adelaida.
R. L. Clisby.
Water (Journal of the Australian Water and Wastewater Association) Vol 1, No 3, p 9-10, September 1974. 1 fig, 3 tab, 2 ref.

Descriptors: *Nitrates, *Groundwater, *Water pollution sources, Animal populations, Water pollution, *Farm wastes, Variability, California, Australia.
Identifiers: Millicent(SA), Mt. Gambier(SA), McVean Springs(Vic), Chino-Corona(Calif).

Four examples, three from Australia and one from California, of nitrogen-rich groundwater are reviewed, and it is shown that in each case, a correlation has been established between farm animal density and the nitrate concentration of the underground water. In at least one case, the high variability of nitrate levels recorded may indicate that nitrate input from animal manures is very localized - around watering points, for instance. (CSIRO)
W75-01247

EFFECTS OF EFFLUENTS OF THE ASTRAKHAN PULP AND BOARD MILL ON SOIL PROPERTIES (VLIYANIE STOCHNYKH VOD ASTRAKHANS-KOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOISTVA POCHV),
V. S. Shumakov, and M. P. Popova.
Pochvovedenie, No 10, p 99-109, 1972. 12 tab, 2 fig, 14 ref, English summary.

Descriptors: *Irrigation, *Irrigable land, *Irrigation effects, *Irrigation ditches, *Waste disposal, *Pulp wastes, *Effluents, *Forest soils, *Soil disposal fields, *Hardwoods, *Deciduous trees, Desalination, Water pollution effects, Discharge(Water), Grasslands, Land management, Soil management, Forest management, Alkalinity, Seasonal.
Identifiers: *Poplar trees, Volga River(USSR).

Three-year field experiments are reported on the feasibility of using paper and board mill effluents for irrigation of poplar plantations in steppe (arid desert) soil. Control plots were irrigated with Volga River water. Effluent irrigation resulted in soil desalination, but more slowly than for water irrigation, and was accompanied by increased solonets process, alkalinity increase (up to 92%), and reduced water absorption. It is concluded that mill effluents can be used to irrigate poplar stands, provided that the undesirable side-effects are minimized by use of seasonal in lieu of permanent (year-round) irrigation ditches. (Stapinski-IPC)
W75-01257

WASTE FROM WASTEPAPER UTILIZATION,
National Council of Air and Stream Improvement, Boston, Mass.
G. W. Gove, and J. J. McKeown.
In: Recycling: Reuse of Waste Resources, TAPPI (Atlanta, Ga.), CA (Committee Assignment) Report No 45, p 57-59, Oct. 1972. 1 tab. (Paper presented at the TAPPI Empire State Section Annual Spring Conference, June 9-10, 1972).

Descriptors: *Solid wastes, *Recycling, *Pulp wastes, Waste water(Pollution), Pulp and paper industry, *Sludge, *Biological treatment, *Biochemical oxygen demand, *Suspended solids.
Identifiers: *Waste papers.

A tabular compilation is given which indicates the amounts of suspended solids, BOD, and potential biological sludge in the raw wastes resulting from the recycling of various grades of waste paper, such as deinked pulps from mixed waste papers, poly-ethylene-coated tissue, newsprint, and mixed-waste paperboards. (Buchanan-IPC)
W75-01261

A STREAM TRACER STUDY USING LITHIUM AS THE TRACER,
Sonoco Products Co., Hartsville, S.C.
F. B. Winslow.
Southern Pulp and Paper Manufacturer, Vol 37, No 6, p 32-34, June 1974. 2 fig, 3 tab.

Descriptors: *Flow measurement, Flow characteristics, Streamflow, *Swamps, *South Carolina, *Tracers, Tracking techniques, Pulp and paper industry, Industrial water, *Water supply, *Water pollution control, Flow profiles, Flow rates, Flooding, Flow, Streams, Wetlands, Streambeds, Self-purification, *Waste assimilative capacity, Water levels, Flood recurrence interval, Environmental control.
Identifiers: Lithium chloride, *Black Creek(South Carolina).

During the development of an environmental protection program at a southern U.S. pulp mill, it became essential to assess the assimilative capacity of Black Creek, a small swampland stream on which the mill is located. Normally this stream flows in a narrow channel averaging 8-10 ft in water level. During medium and high flows, the creek overflows its banks and floods the adjacent swamp over an area manyfold that of the original channel. The data needed to determine stream velocity and flow patterns were obtained by measuring the time required for a tracer (lithium chloride) to traverse a 15-mile stretch between Hartsville and Darlington under low and medium flow regimes. Stream velocities calculated for the two runs were essentially equal. The geometry of the stream's cross-section indicated slower velocities at higher flows, but this effect was offset by the changing flow pattern during rising water levels. (Witt-IPC)
W75-01263

LONG-TERM BOD DETERMINATIONS ON BIOLOGICALLY TREATED AND UNTREATED KRAFT MILL EFFLUENT DISCHARGED TO LAKE SAIMAA, FINLAND,
National Water Board of Finland, Helsinki. Research Inst.
H. Hildenheimo, and M. F. Wilson.
Water Research, Vol 8, No 8, p 535-541, Aug. 1974. 4 fig, 5 tab, 11 ref.

Descriptors: *Pulp wastes, Effluents, *Lakes, *Biochemical oxygen demand, Waste treatment, Waste water(Pollution), *Lignins, *Oxidation, *Biodegradation, Waste water treatment, Chemical reactions, Kinetics, Industrial wastes, Temperature, Aeration, Oxygen demand, Europe, Pulp and paper industry, Biological treatment.
Identifiers: Kraft mills, *Finland(Lake Saimaa).

Effluents discharged by a kraft mill in eastern Finland were evaluated for 200-day BOD at 2C, 5C, 10C and 20C before and after biological extended aeration, using a conventional dilution method and a special sample bottle sealing technique. The BOD curves indicated that the untreated effluent exerted a two-stage oxygen demand on the receiving waters. The second stage commenced after ca. 28 days and was attributed to the oxidation of certain lignin compounds. The treated effluent had a low BOD and showed no second stage of oxygen uptake. (Witt-IPC)

W75-01264

OCCURRENCE OF PESTICIDES IN SELECTED WATER SOURCES IN ISRAEL,
Water Planning for Israel, Tel-Aviv.
Y. Kahanovitch, and N. Lahav.
Environmental Science and Technology, Vol 8, No 8, p 762-765, Aug 1974. 1 fig, 3 tab, 8 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Natural streams, *Water analysis, *Water pollution sources, Agricultural runoff, Municipal wastes, Organic pesticides, Pollutants, Pesticides, *Pollutant identification, Sewage.
Identifiers: *Israel, *Lindane, *Benzene hexachloride, Dan River(Israel), Lake Kinneret(Israel).

The concentrations of 12 organic pesticides were determined in selected water samples in Israel. Where pesticides were identified, their concentrations were much lower than the permitted levels; in the majority of the water samples studied, the pesticidal concentrations were in the order of a few nanograms/liter. The only samples that did not contain pesticides were from the Dan River and drainage water from agricultural fields. The most widespread compounds in the water studied were gamma- and alpha-benzene hexachloride. The high concentrations of gamma-benzene hexachloride in municipal sewage indicate that this is an important source of benzene hexachloride in the water bodies studied. The relative low and constant pesticide levels in Lake Kinneret and the other water reservoirs probably result from the buffering action of the bottom sediment. (Witt-IPC)
W75-01268

COLOR OF PULP INDUSTRY WASTE LIQUORS. V. CONTRIBUTION OF WOOD COMPONENTS TO THE COLOR OF WASTE LIQUORS FROM KRAFT AND SULFITE PULPING (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Sameshima, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 20, No 6, p 284-289, June 1974. 2 fig, 5 tab, 18 ref. English summary.

Descriptors: *Color, *Pulp wastes, *Lignins, *Carbohydrates, *Chemical oxygen demand, *Sulfite liquors, Hardwood, Softwood, Effluents, Pine trees, Birch trees, Organic compounds, Sulfonates.
Identifiers: Pulpwood, Hemicelluloses, Wood extractives, Spent pulping liquors, Black liquors, Spent sulfite liquors, Lignosulfonates, Wood, Kraft pulping, Sulfite pulping.

By sequential removal of wood components (lignin, hemicelluloses, extractives) from the wood meal of Japanese red pine (Pinus densiflora) and Japanese birch (Betula tauschii), their relative contributions to the color and the COD of kraft and sulfite pulping waste liquors could be calculated. The color of effluents from both the softwood and the hardwood was attributable mainly (64-73%) to lignin and secondly (24%) to hemicelluloses in kraft digestions, and only 19% to extractives in sulfite cooks. The COD of both kraft and sulfite effluents also came firstly from lignin (46-61%) and secondly from hemicelluloses (31-32%). The contribution of isolated lignin fractions to the color of the original kraft effluent was, however, increased to 85-90%, suggesting the possible uptake to color bodies derived from hemicellulose. The color of lignin fractions isolated from spent sulfite liquor deepened during their isolation; hence conventional lignosulfonate preparations do not represent the true color of fresh spent sulfite liquor. (See also W74-04512, W73-14028, and W73-15189) (Brown-IPC)
W75-01271

YEASTS OCCURRING IN THE EFFLUENT DISPOSAL BASINS OF A PULP MILL IN SASKATCHEWAN,
National Research Council of Canada, Saskatoon (Saskatchewan). Prairie Regional Lab.
J. F. T. Spencer, P. A. J. Gorin, and N. R. Gardner.
Canadian Journal of Microbiology, Vol 20, No 7, p 993-998, July 1974. 5 tab, 14 ref.

Descriptors: *Yeasts, Microorganisms, *Pulp wastes, *Discharge(Water), *Aquatic microorganisms, *Bacteria, Effluents, *Canada, Basins, Settling basins, Chemical oxygen demand, Bioassay.
Identifiers: Kraft mills, Bleach plants.

The yeast count in the effluent-discharge system of a bleached kraft pulp mill (Prince Albert Pulp Co.) was usually below 500,000 cells/liter, but occasionally reached 1 million cells/liter. Common isolates of Rhodotorula species sometimes accounted for 50% of the population, but usually for smaller proportions. Highest counts were observed in late summer and early fall. A wider range of yeast species was found in the pulp mill disposal basins than in the nearby Saskatoon sewage treatment plant. Most of the ascosporogenous yeasts included Hansenula or Pichia species, usually occurring in association with trees, as do many of the isolated Candida species. Bacterial counts varied from 20 to 74 million cells/ml. The waste water COD sometimes reached ca. 1200 mg/liter, but decreased as the effluent moved through the disposal system. About 40% of the total COD was removed during treatment. (Witt-IPC)
W75-01282

AN EXAMPLE OF THE USE OF BACTERIOPHAGE AS A GROUNDWATER TRACER,
Halcrow (William) and Partners, London (England).
For primary bibliographic entry see Field 2F.
W75-01291

MICROBIAL ACTIVITIES DURING SEWAGE TREATMENT IN LAGOONS I. CHANGES IN AEROBIC AND ANAEROBIC BACTERIA, ACTINOMYCETES, FUNGI, II. CHANGES IN DIFFERENT TYPES OF FUNGI, III. CHANGES IN BOD AND DEHYDROGENASE ACTIVITY,
Tuskegee Inst., Ala. Dept. of Agricultural Sciences.
K. S. Chahal.
Available from the National Technical Information Service , Springfield, Va. 22161 as PB-237 501, $3.75 paper copy, $2.25 in microfiche. Completion Report, (1974). 38 p, 9 fig, 9 tab, 7 ref. OWRT B-015-ALA(3).

Descriptors: *Sewage, *Sewage lagoons, Microbiology, Biological properties, Sewage treatment, *Biochemical oxygen demand, Oxidation, Waste water treatment, *Microbial degradation, Aerobic bacteria, Anaerobic bacteria, Actinomycetes, Fungi, Bioindicators.
Identifiers: *Dehydrogenase activity.

Two domestic sewage lagoons were used to study BOD and dehydrogenase activity changes during one year period. Both BOD and dehydrogenase activity were higher during summer months than winter. BOD in the effluent followed the same pattern as BOD in the influent. Dehydrogenase activity and BOD followed the same trend during the one year period of this study. It is suggested that due to simplicity, fastness and accuracy of the method, dehydrogenase activity may be a better method to determine the oxidation rate in sewage lagoons and wastewaters.
W75-01318

ANALOG SUBROUTINES FOR THE FINITE ELEMENT METHOD,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 4B.
W75-01320

DIGITAL SIMULATION LANGUAGE FOR DISTRIBUTED PARAMETER SYSTEM IDENTIFICATION,
California Univ., Los Angeles. Dept. of Computer Science.
For primary bibliographic entry see Field 7C.
W75-01321

THE EFFECT OF A MUNICIPAL EFFLUENT ON THE PHYTOPLANKTON COMPOSITION AND DIVERSITY OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W75-01322

AN EXPERIMENTAL AND ANALYTICAL STUDY OF THERMAL STRUCTURE IN HEATED AND COOLED STAGNANT WATERS,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
D. M. Snider.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 495, $5.25 in paper copy, $2.25 in microfiche. Master of Science Thesis, August 1973. 107 p, 29 fig, 1 tab, 48 ref, 3 append. OWRT A-029-IND(3).

Descriptors: *Thermal properties, *Thermal stratification, *Thermocline, *Heat transfer, *Energy equation, *Energy transfer, Thermal, Evaporation, Convection, Solar radiation, Temperature, Heat, Thermal radiation, Thermal pollution, Radiation, Infrared radiation, Epilimnion, Hypolimnion, Lakes, Reservoirs, Simulation analysis.
Identifiers: Radiative transfer, Radiant energy.

The transient heating by solar radiation and cooling from the surface by convection, evaporation and radiation of lake or reservoir were modeled experimentally in the laboratory. Accurate temperature measurements were obtained using a Mech-Zehnder interferometer which did not disturb the temperature, radiation or flow fields. The transient temperature distribution in the layer of water heated by radiation was predicted by solving the energy equation both analytically in closed form and numerically using a finite difference method. The volumetric rate of absorption of radiant energy in the water was determined from basic principles. A lake or reservoir was experimentally simulated in the laboratory by stagnant water in a 42 cm deep, 25 cm wide and 10 cm thick test cell. Insolation was simulated using tungsten filament lamps in parabolic reflectors which produced collimated incident radiation flux. Comparison of experimental data with the predicted temperature distributions showed good agreement, thus verifying the analytical model. The numerical finite difference results were found to agree better with the data than those based on the closed form analytical solution with a linearized boundary condition.
W75-01324

GULL LAKE: PAST, PRESENT, FUTURE.
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 530, $3.75 in paper copy, $2.25 in microfiche. September 1973, 26 p. D. F. Tague, and G. H. Lauff, eds. OWRT B-021(1) and B-032 MICH(1). 14-31-0001-3599. 14-31-0001-4094.

Descriptors: *Eutrophication, *Domestic waters, *Phosphorus, Oxygen, Lakes, *Michigan, *Septic tanks, Water quality, Fertilization, Sewerage, Water pollution sources.
Identifiers: *Gull Lake(Mich), *Citizens groups, Septic systems, Lawn Fertilization.

A brochure outlines the cultural causes of eutrophication of one of Michigan's large lakes and the alternative to corrective management of the lake and surrounding areas. Gull Lake in southwestern Michigan has been suffering from accelerating deterioration of water quality since at least 1965. The principal cause of this degradation is phosphorus enrichment originating from septic systems and excessive lawn fertilization. Management practices proposed are (1) replacing septic tank systems with a sewage system and (2) reduction in fertilization of lawns. (Ball-Michigan)
W75-01327

HYDROLOGIC EFFECTS OF STRIP COAL MINING IN SOUTHEASTERN MONTANA - EMPHASIS: ONE YEAR OF MINING NEAR DECKER,
Montana Bureau of Mines and Geology, Butte.
W. A. Van Voast.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 511, $3.75 in paper copy, $2.25 in microfiche. Montana College of Mineral Science and Technology, Butte, Completion Report, Bulletin 93, 1974. 24 p, 11 fig, 3 tab, 16 ref.

Descriptors: *Coal mines, *Strip mines, *Drawdown, *Water table, *Montana, Water pollution sources, Groundwater, Wells, Hydrologic aspects, Effluents, Aquifers, Leachate.
Identifiers: Decker(Mont), Coal bed aquifers, Tongue River(Mont).

A coal-bed aquifer currently being mined near Decker is an important source of groundwater for stock and domestic uses. Piezometric surfaces for the aquifer and another below it have adjusted downward in response to the first year of mining. The mine is in an area of local discharge for the aquifer and is intercepting about 40,000 gallons of water per day that previously discharged naturally to the Tongue River. Water-level drawdowns caused by pumpage from the mine have induced lateral flow from all directions and vertical flow from below, producing a total mine influent and effluent of about 400,000 gallons per day. The effluent is a chemical mixture of influent waters, but contains anomalous high sulfate and nitrate concentrations attributed to dissolution from pulverized coal and overburden and residuals from ammonium-nitrate explosives. Water-level declines will continue but at a decreasing rate as mining proceeds. Wells very close to the final mine cut will become non-productive. After completion of mining, spoils will generate leachates more strongly mineralized than other local waters; probable leachate discharge rates are uncertain but will be less than the pre-mining flow rate through the area. Final groundwater level conditions will adjust, depending upon treatment of the final cut.
W75-01329

EFFECTS OF TEMPERATURE ON THE TOXICITY OF OIL REFINERY WASTE, SODIUM CHLORATE, AND TREATED SEWAGE TO FATHEAD MINNOWS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W75-01333

THE CHEMISTRY AND TRANSPORT OF LEAD AND CADMIUM IN SOILS,
Utah Water Research Lab., Logan.
J. J. Jurinak, and J. Santillan-Medrano.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 497, $5.75 in paper copy, $2.25 in microfiche. Research Report No 18, June 1974, Utah Agricultural Experiment Station, Logan. 121 p, 42 fig, 21 ref, append. OWRT A-014-UTAH(1). 14-31-0001-4045.

Descriptors: *Heavy metals, *Lead, *Cadmium, *Ion transport, Leaching, Groundwater, Industrial wastes, Soil chemistry, Phosphorus compounds, Soil contamination, Chemical precipitation, Water pollution sources, *Path of pollutants, Model studies.
Identifiers: Heavy metal retention, Lead phosphate, Cadmium phosphate, Heavy metal carbonates, Lead hydroxide.

A one-dimensional transport model for the movement of lead (Pb) and cadmium (Cd) ions through soils under steady state saturated moisture flow was developed. The chemical processes considered were: precipitation and dissolution, ion-pair formation, pH formation, pH flux and adsorption or cation exchange. The transport model was tested by data from laboratory soil columns using three soil types. Initially both chemical equilibrium and kinetic studies were conducted to obtain data necessary for interpretive aspects of the column studies. The main mechanism regulating Pb solubility in the nm-calcareous soils was the precipitation of Pb5(PO4)3OH, Pb3(PO4)2, and Pb(OH)2. In calcareaous soils, PbCO3 can also precipitate. The solubility of Cd in soils is considerably greater than Pb in the pH range of 5 to 9. At low concentrations of Cd, adsorption by soil is an important mechanism of retention. At higher concentrations, precipitation of Cd3(PO4)2 appears to regulate Cd solubility. The transport model was effective in predicting Cd and Pb movement in soils after the initial 20-25 pore volumes of effluent passed through the soil column. Initial stages of transport were not accurately predicted because of the inability of the model to accurately predict the pH flux when the acid metal slug was added to the soil surface. The mobility of Cd in soil was noticeably greater than that of Pb.
W75-01335

EFFECTS OF CHRONIC OIL CONTAMINATION ON AQUATIC DIPTERANS: A STATE OF THE ART REPORT,
Vermont Univ., Burlington. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W75-01336

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3A,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1974. 57 p, 2 fig, 4 tab, 6 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, Dissolved oxygen, Suspended load, *Waste assimilative capacity.
Identifiers: *Arkansas River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3A of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. The segment consists chiefly on a 31-mile reach of the Arkansas River, a 143-mile reach of Bayou Meto, and a 50-mile reach of Bayou Two Prairie. Dischargers in the segment consist of 13 municipalities and one industry. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. Under the specified conditions the concentration of total dissolved solids, chlorides, sulfates, and dissolved oxygen in the Arkansas River will meet water-quality standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01353

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3B,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 73 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, Dissolved oxygen, Suspended load, *Waste assimilative capacity.
Identifiers: *Arkansas River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are given for Segment 3B of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. The segment consists of a 93-mile reach of the Arkansas River and several small tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of eight municipalities and three industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. Under these conditions the main stem of the Arkansas River in this segment will meet water-quality standards (State of Arkansas, 1973. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4), for each discharger are summarized. (Knapp-USGS)
W75-01354

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3C,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 54 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, Dissolved oxygen, Suspended load, *Waste assimilative capacity.
Identifiers: *Arkansas River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3C of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the

average of once in 10 years. The segment consists of a 35-mile reach of the Arkansas River and several small tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of five municipalities and one industry. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01355

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, FOURCHE LAFAVE RIVER, SEGMENT 3D,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1974. 49 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, Dissolved oxygen, Suspended load, *Waste assimilative capacity.
Identifiers: *Fourche LaFave River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3D of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and proposed and existing waste sources in segment 3D are shown schematically. The segment consists of a 148-mile reach of the Fourche LaFave River and two tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of two municipalities. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the dissolved oxygen concentration in the Fourche LaFave River will not meet water-quality standards. By reducing effluent CBOD5 and NBOD5 to 5.0 mg/liter and 0.0 mg/liter, respectively, of wastes discharged into Fourche LaFave River, the stream will meet dissolved oxygen standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01356

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3E,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 65 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Suspended load, Dissolved oxygen.
Identifiers: *Arkansas River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3E of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources, both proposed and existing, in Segment 3E are shown schematically. The segment consists of a 49-mile reach of the Arkansas River and several small tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of five municipalities and three industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that under these conditions the main stem of the Arkansas River in this segment will meet water-quality standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01357

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, PETIT JEAN AND POTEAU RIVERS, SEGMENT 3F,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1974. 78 p, 3 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Dissolved oxygen, Suspended load.
Identifiers: *Petit Jean River(Ark), *Poteau River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3F of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources in Segment 3F are shown schematically. The segment consists chiefly of a 118-mile reach of the Petit Jean River and a 41-mile reach of the Poteau River. Waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of four municipalities and three industries. The wastes discharged by industries are insignificant. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that for both streams, under the specified conditions, dissolved oxygen concentrations will not meet water-quality standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01358

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4E,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1974. 195 p, 5 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Suspended load, Dissolved oxygen.
Identifiers: *White River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 4E of the White River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources in Segment 4E are shown schematically. Chiefly, the segment consists of a 69-mile reach of the White River, a 171-mile reach of the Black River, a 117-mile reach of the Strawberry River, and a 79-mile reach of the Little Red River. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The first subreach (mile 79 to 67) of the Little Red River does not meet dissolved oxygen standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), clorides, (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01359

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, SEGMENT 1C,
Geological Survey, Little Rock, Ark.
C. T. Bryant.
Open-file report, 1974. 125 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control, *Waste assimilative capacity, Dissolved oxygen, Suspended load.
Identifiers: *Red River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 1C of the Red River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. The segment consists chiefly of a 78-mile reach of Little River, a 40-mile reach of Rolling Fork, a 77-mile reach of the Cossatot River, and an 83-mile reach of the Saline River. Dischargers in the segment consist of eight mu-

nicipalities and four industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01360

FIVE-DAY BOD GENERATED DURING BLEACHING OF PULP IN THE GEMER PULP AND PAPER MILL (MNOZSTVO BSK(5) PRI BIELENI PAPIERENSKEJ BUNICINY V GEMERSKEJ CELULOZKE A PAPIERNI),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
L. Balhar, T. Halmova, E. Gundova, and J. Strenger.
Papir a Celuloza, Vol 29, No 6, p 125-127, 130, 1974. 1 fig, 4 tab, 7 ref.

Descriptors: *Bleaching wastes, *Pulp wastes, *Biochemical oxygen demand, *Chemical oxygen demand, *Chlorination, *Water pollution sources, Chlorine, Alkalis(Bases), Effluents, Waste water treatment, Industrial wastes.
Identifiers: Hypochlorites, Chlorine compounds, Bleach plants.

The amounts of 5-day BOD produced during bleaching of sulfite pulps (cooked to kappapermanganate-numbers of 16.52 and 15.11) were determined in the laboratory and compared with commerical-scale operating experience. Results showed that the treatment of pulp with chlorine, caustic, and hypochlorite in three stages produced 7.64 kg of 5-day BOD and 69.74 kg of COD per ton of pulp bleached to 81-82 degrees brightness. Bleaching in the laboratory generated somewhat less BOD and COD than mill-scale bleaching. A correlation between BOD and COD generation was found only for the effluent of the third bleaching stage.
W75-01381

EUTROPHICATION: A MATHEMATICAL MODEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5C.
W75-01385

GROUNDWATER RECHARGE AND QUALITY TRANSFORMATIONS DURING THE INITIATION AND MANAGEMENT OF A NEW STABILIZATION LAGOON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5D.
W75-01387

WATER QUALITY IN THE LOWER COLORADO RIVER AND THE EFFECT OF RESERVOIRS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
G. C. Slawson, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 681, $5.75 in paper copy, $2.25 in microfiche. Technical Report No 12, July 1972. 118 p, 39 fig, 13 tab, 17 ref. OWRR A-036-ARIZ(1). 14-31-0001-3503.

Descriptors: Saline lakes, Saline water, *Salinity, *Model studies, Water quality, *Colorado River, Reservoirs, *Path of pollutants, Time series analysis, *Water quality control.
Identifiers: Salinity control, Sources of salt loading, Spectral analysis, Reservoir dynamics.

Comparison of the power spectra of total dissolved solids (TDS) time series from different locations on the Lower Colorado River is useful in showing changes in salinity and for indicating physical factors influencing salinity. Similarities between the power spectra of the Lee Ferry and Grand Canyon time series indicated that lateral inputs and evaporation are not greatly influencing the salinity cycle. The salinity change within this reach was approximated by a constant concentration change of 66.6 ppm. A similar model form was used for the Hoover Dam to Parker Dam reach. Dissimilarities between power spectra indicated that additional inputs are significant and must be accounted for in any model of such reaches. The model for Lake Mead required compensation for evaporation and for the inputs of the Virgin River and Las Vegas Wash. The modeled salinity increase between Parker Dam and Yuma contained a trend factor to allow for the effect of irrigation return flows and seepage. The crosscovariance function was used to approximate the time lag between data stations. Time series statistics, including coherence, response function spectra, and overall unit response, were used and are of utility in estimating salinity in a river system.
W75-01396

BIOGEOCHEMICAL CYCLES FOR THE CHEMICAL ELEMENTS IN NYMPHAEA ODORATA AIT. AND THE APHID RHOPALOSIPHYM NYMPHAEAE (L.) LIVING IN LINSLEY POND,
Pittsburgh Univ., Pa. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W75-01402

RELATIONSHIP OF VARIOUS INDICES OF WATER QUALITY TO DENITRIFICATION IN SURFACE WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. B. Owens, and D. W. Nelson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 702, $3.25 in paper copy, $2.25 in microfiche. 1972. 19 p, 8 fig, 17 ref. OWRR A-019-IND(2).

Descriptors: *Denitrification, *Anaerobic bacteria, *Farm ponds, *Nitrates, *Ammonification, Chemical reactions, Carbon, Oxygen, Dissolved oxygen, Surface water, *Indiana, Aerobic conditions.
Identifiers: *Denitrifying bacteria, *Wabash River(Ind).

Water samples were collected monthly from three farm ponds and from three locations on the Wabash River near Lafayette, Indiana to determine the actual and potential rates of denitrification in such water systems. Denitrification may serve as an important mechanism for nitrate removal from surface waters. Water parameters which may affect denitrification were estimated at the time of sampling and then related to the denitrification rates observed. Actual and potential denitrification rates observed. Actual and potential denitrification rates were normally small unless an energy source was added, indicating that the low amount of dissolved carbon as well as a high dissolved O2 content may be the factors limiting denitrification in surface waters. Water temperature, pH level, nitrate level, and numbers of denitrifying bacteria appeared suitable for denitrification during most of the year. Higher levels of denitrifying bacteria, nitrate, and phosphorus existed in the river than in the ponds, while the ponds had slightly higher dissolved carbon levels. The nitrate-N levels did not exceed the United States Public Health Service standard of 10 parts per million, and the river and pond surface water remained aerobic throughout the year.
W75-01404

A CONTINUOUS FLOW KINETIC MODEL TO PREDICT THE EFFECTS OF TEMPERATURE ON THE TOXICITY OF OIL REFINERY WASTE TO ALGAE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5C.
W75-01408

DESIGN AND CONSTRUCTION OF A RESEARCH STATION FOR THE STUDY OF INDUCED VERTICAL MIXING IN A THERMALLY STRATIFIED POND USING WARM WATER DISCHARGE,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
V. Alavian.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 701, $4.75 in paper copy, $2.25 in microfiche. MS Thesis, 1973. 84 p, 19 figs, 3 refs, 2 append. OWRR B-080-WIS(2). 14-31-0001-3948.

Descriptors: *Water quality control, *Thermal stratification, Discharge(Water), Lakes, Reservoirs, Chemicals, Aquatic weeds, *Oxygenation, *Model studies, Design, Thermal pollution, Research facilities, *Mixing, Jets.
Identifiers: *Vertical mixing.

Various methods have been proposed to improve the quality of water in lakes and reservoirs; some of these involve application of chemicals to the water, cutting of weeds along shorelines, adjusting lake levels, aeration, and artificial destratification. The basic objective of this project is to determine in a natural impoundment the feasibility and criteria for inducing vertical mixing by injecting heated water near the bottom of the impoundment. Additional objectives include measurement of the heat budget of the impoundment, comparison of evaporative heat losses from the impoundment with various predictive models, study of the effect of heat on aquatic life in the impoundment, study of dissolved oxygen changes due to vertical mixing, and comparison of results with laboratory studies and mathematical models. A detailed discussion is presented of the components of the research station constructed for the above mentioned objectives. The components include the water piping system, the discharge jet assembly, the meteorological station, the sensors and recording system, and the overall control system. The sensors and recording systems are in operation; however, the system for heating the discharge is not quite complete. Actual heated discharge experiments will begin in Spring, 1974.
W75-01409

PRELIMINARY SURVEY OF TOXICITY OF CHLORINATED SEWAGE TO SOCKEYE AND PINK SALMON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
For primary bibliographic entry see Field 5C.
W75-01413

ALGAL CANCER AND ITS CAUSES-II. SEPARATION OF CARCINOGENIC COMPOUNDS FROM SEA BOTTOM MUD POLLUTED BY WASTES OF THE COAL CHEMICAL INDUSTRY, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
For primary bibliographic entry see Field 5C.
W75-01416

MERCURY AND SELECTED PESTICIDE LEVELS IN FISH AND WILDLIFE OF UTAH: I. LEVELS OF MERCURY, DDT, DDE, DIELDRIN AND PCB IN FISH,
Utah Cooperative Wildlife Research Unit, Logan.
F. A. Smith, R. P. Sharma, R. I. Lynn, and J. B. Low.
Bulletin of Environmental Contamination and Toxicology, Vol 12, No 2, p 218-223, August, 1974. 2 tab, 9 ref.

Descriptors: *Mercury, Polychlorinated biphenyls, *DDT, *DDE, *Dieldrin, *Wildlife, *Sport fish, *Utah, Insecticides, Pesticides, Path of pollutants, Standards, Analytical techniques, Absorption, Rainbow trout, Sunfishes, Brown trout, Bass, Cisco, Carp, Pikes, Yellow perch.
Identifiers: Tissue analysis, Bioaccumulation, Whitefish.

The levels of mercury, dieldrin, DDT and DDE in consumable tissues of fish and wildlife of Utah were analyzed. Evaluation of safety to consume tissues of these animals was based on tolerance levels established by the Food and Drug Administration. The levels of mercury present were generally lower than the guideline limit of 0.5ppm in most fish except those obtained from localized area. Predators had the greatest accumulation of mercury. Only small amounts of pesticides were found in fish. A majority of the tissues contained appreciable levels of PCB's. No definite relationship between the levels of mercury and pesticides or PCB's was noted. (Katz)
W75-01420

WATER-SOLUBLE HYDROCARBONS FROM CRUDE OIL,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
C. C. Lee, W. K. Craig, and P. J. Smith.
Bulletin of Environmental Contamination and Toxicology, Vol 12, No 2, pp 212-217, August 1974. 2 fig, 2 tab, 3 ref.

Descriptors: *Oil spills, *Oil, *Water analysis, *Chemical analysis, Oil pollution, Water pollution, Water pollution sources, Analytical techniques, *Gas chromatography, Organic compounds, *Pollutant identification, Pollutants, Separation techniques.
Identifiers: Water soluble components, Crude oil.

Water soluble components of crude oil remain in the environment even after clean-up of a spill. A study on the nature and amounts of water-soluble materials that can be derived from crude petroleum was undertaken. Ten oil samples were analyzed both quantitatively and qualitatively using gas chromatography. The relative composition of the hydrocarbons that were detected differed for the different oils and in principle, these differences could serve as an aid in the identification of the original oil. (Katz)
W75-01422

HEAVY METALS IN THE NORTHERN FUR SEAL, CALLORHINUS URSINUS, AND HARBOR SEAL, PHOCA VITULINA RICHARDI,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W75-01425

WARMING OF THE WORLD'S WATERS BY MAN,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W75-01432

POSSIBLE FATE OF OIL IN THE ARCTIC BASIN,
Department of the Environment, Ottawa, (Ontario). Glaciology Div.
R. O. Ramseier.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 58-70, 5 fig, 3 tab, 23 ref.

Descriptors: *Arctic, *Environment, *Water pollution sources, *Oil pollution, Polar regions, Oil, Oil spills, Natural resources, Ice, Ice cover, Arctic Ocean, Cold regions.

In most potential accidents oil would become trapped under the ice cover and would be almost impossible to clean up. Since this oil would not be exposed to the atmosphere, ageing would not take place. Oil trapped under the ice could move with the ice into the Beaufort Gyre which contains some of the oldest and heaviest ice in the Arctic. Oil spilled off the Siberian coast could move into the Transpolar Drift Stream and would diffuse over a large area. Ice movement velocities of as much as 10 km a day have been observed. Ice takes from 7 to 10 years to travel around the Beaufort Gyre. During this period the oil would become entrapped within the ice, forming oil lenses. Considering the equilibrium age of the pack ice, it would take four years for the oil to appear on the ice surface. This would cause a large decrease in surface reflectivity. Formation of pressure ridges could cause oil contained in leads to flow onto the ice surface causing a further decrease in albedo. Run-off from hummocks and ridges could also increase the ice contamination. Due to the extreme meteorological conditions and the continuous danger of moving ice, off-shore installations and pipelines could be damaged causing a massive release of oil. (See also W75-01428) (Humphreys-ISWS)
W75-01433

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens.
M. U. Ahmad.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 81-91, 1 fig, 1 tab, 22 ref.

Descriptors: *Water pollution sources, *Environment, *Water pollution effects, *Acid mine water, Water quality, Groundwater, Mine acids, Mine drainage, Mining, Coal mine wastes, Coal mines, Strip mines, Appalachian mountain region.

Coal mining has seriously degraded the water quality of streams in Appalachia and other parts of the United States, and in some cases underground aquifers. In the Applachian regions, about 6000 tons of sulfuric acid is produced daily through oxidation of pyrite. A typical acid discharge may have pH levels of 3.5-6.6, acidity content of 0-1000 ppm, sulfate content of 500-1000 ppm, and an iron content of 0-500 ppm. The flow patterns of surface and subsurface waters are closely related in hilly regions. The mining of coal has at the present time seriously disturbed this interrelated hydrological system in over 11 million acres of land. Strip mining often lowers the water table in the undisturbed land by increasing the surface area over which water can be lost through seepage face, subsequent leaching of the pyrite and then the introduction of acid and salts into streams of the mined area. One of the strip mines that was studied in detail is the Sheban Mine, covering about 79 acres near Youngstown, Ohio. This mine produces 60,000,000 gallons of highly acidic water per year, that directly affects the drinking water supply of Youngstown. Four million acres of land in the United States have been so disturbed. Large area of stripped land could not supply good quality water. Rural water supplies in coal mining districts are being seriously threatened by stripping. No effective method has yet been devised to stop the acid production. (See also W75-01428) (Humphreys-ISWS)
W75-01435

SOME WATER RESOURCES PROBLEMS AND HUMAN ENVIRONMENT,
Haryana Public Works Dept., Chandigarh (India), Irrigation Works.
For primary bibliographic entry see Field 4A.
W75-01436

SHALLOW-WATER ZONATION OF SEA-LOCH BENTHOS AND ITS RELATION TO HYDROGRAPHIC AND OTHER PHYSICAL FEATURES,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 2L.
W75-01472

WIND-BLOWN DUST AS A SOURCE OF NUTRIENTS FOR AQUATIC PLANTS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
C. L. McLay.
Environmental Pollution, Vol 5, No 3, p 173-180, 1973. 3 fig, 3 tab, 7 ref.

Descriptors: *Cycling nutrients, *Dusts, *Water pollution sources, *Aquatic plants, Plant growth, Salts, Rain water, Leaching, *California.
Identifiers: Lemna perpusilla, Scirpus californicus, Lake Los Carneros(Calif).

Since raindrops are formed around dust particles in the air, an analysis of the nutrient composition of uncontaminated rainwater should suggest what nutrients are liable to be transported as dust. Plants used in the experiment came from Lake Los Carneros, a small alkaline lake near Santa Barbara, California. Results of an experiment to measure the response of Lemna perpusilla to dust washed from the stems of Scirpus californicus are reported. Duckweed growth was stimulated by the washings and it was also found that growth could be stimulated by dust that had accumulated on a concrete wall near the lake. It is evident that dust from both sources can produce an immediate growth response by duckweed and so must contain soluble nutrients. There is some evidence that salts leached from the Scirpus stems may have been partially responsible for the increase in growth, and the utilization of nutrients from this source by aquatic plants represents a previously unsuspected pathway in the nutrient cycle of a lake. (Jones-Wisconsin)
W75-01483

NITROGEN: A PROBLEM OF DECREASING DILUTION,
Imperial College of Science and Technology, London (England). Dept. of Mathematics.
R. Scorer.
New Scientist, Vol 62, No 895, p 182-184, 1974. 2 fig.

Descriptors: *Nitrogen, *Public health, Human population, Potable water, Nitrates, Water purification, Sewage, Agriculture, Water pollution sources.
Identifiers: *England, *Thames River(England), Lee River(England).

The problem of nitrogen pollution has grown to unexpectedly awkward proportions in Britain during the past three years. The number of mg/N, in the form of nitrate, per liter of potable water at the intakes on the Rivers Thames and Lee has increased erratically and with seasonal variations. In 1972, for the first time during a short period, Lee water contained more than 11.3 mg/N/1. In 1971 the trends indicated that Lee water would exceed the safe limit (11.3 mg/1) all the time by 1974, and in 1972 it appeared that the Thames water might exceed it by 1976. Two main sources of nitrate are sewage works and nitrogenous waste runoff. The latter is carried into rivers mainly in the winter. There are several ways of meeting this situation and proposals to overcome this public health hazard are discussed. (Jones-Wisconsin)
W75-01502

SPRING RUN-OFF INTO MASSACHUSETTS BAY, 1973,
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
V. Manohar-Maharaj, and R. C. Beardsley.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-74-10407, $7.25 in paper copy, $2.25 in microfiche. Part I of: Spring Run-off and Nutrient-Seawater Density Correlations in the Massachusetts Bay, Report No MITSG 74-9, November 1973. 103 p, 33 fig, 10 tab, 20 ref, 4 append. NOAA NG-43-72.

Descriptors: *Volumetric analysis, *Bays, *Spring, Runoff, *Massachusetts, Salinity, Freshwater, Distribution, Nutrients.
Identifiers: *Massachusetts Bay, Merrimac River(Mass).

A detailed section of Massachusetts Bay was studied to form a data base for future work and to use the data collected to determine the volume of fresh water in the bay and compare that value with the outflow of the rivers. The study (five cruises) was conducted during the spring 1973; at the time the homogeneous state of the water is eroded, and a thermocline and halocline develop. The man salinity over the depth for the water from Cape Ann to Cohasset Harbor was computed to obtain the amount of fresh water in the bay. This volume was then compared with the volume of fresh water coming into the bay from rivers and from the Deer Island sewage treatment plant. The volume of fresh water in the bay and the influx of fresh water from spring runoff were found to compare quite well. The major loss of fresh water from the region during the spring seemed to be diffusion of salt into the bay rather than advection of fresh water out of the bay. It was shown that the Merrimac River accounted for about 90% of the volume of fresh water. (See also W75-01510) (Jones-Wisconsin)
W75-01509

DISSOLVED NUTRIENT-SEAWATER DENSITY CORRELATIONS AND THE CIRCULATION IN BOSTON HARBOR AND VICINITY,
Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
For primary bibliographic entry see Field 2L.
W75-01510

DETERMINATION OF WATER QUALITY PARAMETERS IN THE MASSACHUSETTS BAY (1970-1973),
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
S. L. Frankel, and B. R. Pearce.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-74-10269, $9.50 in paper copy, $2.25 in microfiche. Sea Grant Project Office Report No MITSG 74-8, November 1973. 342 p, 54 fig, 1 tab, 10 ref, 4 append. NOAA NG-43-72, NOAA 04-3-022-10.

Descriptors: *Baseline studies, *Water properties, *Bays, Massachusetts, Mathematical studies, Physical properties, Chemical properties, Limiting factors, Turbidity, Nutrients, Productivity, Suspended load, Nitrogen, Biomass, Organic matter, Coasts, Tides, Currents(Water), Phosphates, Nitrogen, Water pollution effects, Silicates, Eutrophication, Computer programs.
Identifiers: *Massachusetts Bay.

Primary emphasis was laid on the definition of pollution problems and development of a predictive hydrodynamic model. Fifteen stations were sampled concurrently with phytoplankton measurements. Samples were taken at two week intervals over the vertical cross section and analyzed. Turbidity, suspended sediments, percent organic material, salinity, depth, tide and currents were measured. Phosphates, nitrites, nitrates, silicates, ammonia and dissolved oxygen were analyzed. By careful measurement of abiotic control, the best and worst areas in the bay can be located and studied. Important to the maintenance of a healthy and aesthetic aquatic environment is the balance between photosynthetic production and respiration. Typically, the ratio between nitrogen and phosphorus in phytoplankton is 16:1. Where typical Massachusetts Bay Environment Data is plotted against an average line of ratio 16:1 of N:P, it can easily be seen that the N:P ratio is far less than 16. Using this data it can be started that nitrogen is the growth limiting factor in Massachusetts Bay coastline waters. Since nitrogen is the limiting growth factor, further addition of phosphate is not the critical polluting factor leading either to increase of algal growth or eutrophication. The critical factor would be the nitrogen input. (Jones-Wisconsin)
W75-01511

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, TYRONZA RIVER, SEGMENT 5D
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 103 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *Tyronza River(Ark), *Water-load allocation.

Data and results of a waste-load allocation study are presented for Segment 5D (Tyronza River) of the St. Francis River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources, both proposed and existing, in Segment 5 D are shown schematically. The segment consists of an approximately 73-mile reach of the Tyronza River (including Ditch No. 31), its principal tributaries, Ditch No. 40 and Big Creek, and several smaller tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of seven municipalities. All industrial wastes are discharged into municipal sewers and thus contribute to municipal waste loads. Undetermined amounts of wastes enter the streams from agricultural runoff. Streamflow in the segment is also increased by agricultural runoff. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions, concentration of total dissolved solids and sulfates in Ditch No. 40 and the Tyronza River will exceed standards set by the State of Arkansas. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01516

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, ST. FRANCIS RIVER, SEGMENT 5C,
Geological Survey, Little Rock, Ark.
C. T. Bryant, M. E. Jennings, and D. P. Bauer.
Open-file report, 1974. 101 p, 7 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *St. Francis River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 5C of the St. Francis River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and proposed and existing waste sources in Segment 5C are shown schematically. The segment consists of a 143-mile reach of the St. Francis River and several tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of 18 municipalities and 6 industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides, (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the main stem of the St. Francis River in this segment will meet water-quality standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01517

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, L'ANGUILLE RIVER, SEGMENT 5B,
Geological Survey, Little Rock, Ark.
C. T. Bryant, M. E. Jennings, and J. E. Reed.
Open-file report, 1974. 66 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *St. Francis River(Ark), *L'Anguille River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 5B, of the L'Anguille River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and proposed and existing waste sources in Segment 5'3 are shown schematically. The segment consists of an 86-mile reach of the L'Anguille River and several small tributaries. Planned and existing waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of six municipalities. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that under these specified conditions the L'Anguille River in this segment will not meet dissolved oxygen and total dissolved solids water-quality standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4), for each discharger are summarized. (Knapp-USGS)

W75-01518

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, BAYOU DEVIEW, SEGMENT 4B,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 53 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *White River(Ark), Bayou DeView(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 4B of the White River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources in Segment 4B are shown schematically. The segment consists of an approximately 113-mile reach of Bayou DeView (including the Big Creek Ditch) and several small tributaries. Bayou DeView drains to the Cache River. Dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of five municipalities and four industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentrations of dissolved oxygen, total dissolved solids, chlorides, and sulfates in Bayou DeView meet standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01519

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3G,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and M. E. Jennings.
Open-file report, 1974. 74 p, 2 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *Arkansas River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 3G of the Arkansas River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and waste sources in Segment 3G are shown schematically. The segment consists of a 99-mile reach of the Arkansas River extending downstream from the Oklahoma State line through Lake Ozark and a part of Lake Dardanelle. The segment also includes tributaries to the Arkansas River. Waste dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of eight municipalities and three industries. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projections and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the main stem of the Arkansas River in this segment will meet water-quality standards. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01520

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, CACHE RIVER, SEGMENT 4C,
Geological Survey, Little Rock, Ark.
C. T. Bryant, and J. E. Reed.
Open-file report, 1974. 109p, 4 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Low flow, *Path of pollutants, *Arkansas, Waste dilution, Model studies, Mathematical models, Water pollution control.
Identifiers: *White River(Ark), *Cache River(Ark), *Waste-load allocation.

Data and results of a waste-load allocation study are presented for Segment 4C of the White River water-quality management planning basin, Arkansas. The water-quality model was calibrated for dissolved oxygen, total dissolved solids, chlorides, and sulfates, by using existing waste-load data and streamflow and water-quality data collected during summer low-flow conditions. Waste-load analyses were made by adjusting the calibrated model to include waste loads expected to exist 5 years from the present time (1974), in combination with the minimum average flow for 7 consecutive days that is expected to occur on the average of once in 10 years. Stream channels and both proposed and existing waste sources in Segment 4C are shown schematically. The segment consists of an approximately 206-mile reach of the Cache River (including Cache River Ditch No. 1) and several small tributaries. Also included is a 77-mile reach of the White River and a 65-mile reach of Village Creek. Planned and existing dischargers in the segment, according to the Arkansas Department of Pollution Control and Ecology, consist of 13 municipalities and one industry. Plots of dissolved oxygen (DO), total dissolved solids (TDS), chlorides (Cl), and sulfates (SO4) resulting from 5-year waste-load projection and Q7-10 low-flow conditions are given. The plots show that under the specified conditions the concentration of dissolved oxygen in subreaches 1 and 2 (mile 206 to mile 188) of the Cache River is less than the standard set by the State of Arkansas. The remaining part of the Cache River and the main stem of the White River in this segment are effluent limited for dissolved oxygen. Carbonaceous waste discharge in terms of 5-day biochemical oxygen demand (CBOD5), nitrogenous oxygen demand as ammonia nitrogen (NH3-N), chlorides (Cl), and sulfates (SO4) for each discharger are summarized. (Knapp-USGS)
W75-01521

SOME CHEMICAL ASPECTS OF THE HUMUS OF UNDERWATER SEDIMENTS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2J.
W75-01603

EFFECTS OF PIPE MATERIALS ON QUALITY OF WATER SAMPLES,
Iowa State Univ., Ames. Dept. of Agronomy.
M. A. Tabatabai, and T. E. Fenton.
Journal of Soil and Water Conservation, Vol 29, No 3, p 125-126, May-June, 1974. 2 tab, 5 ref.

Descriptors: *Pipes, *Water quality, *Construction materials, *Metals, Runoff, *Water sampling, Plastic pipes, Iron, *Iowa.
Identifiers: Iron wells.

Studies for evaluating the effect of metal (iron) wells on groundwater quality in Iowa have shown that water samples collected from metal wells contained markedly lower concentrations of orthophosphate-P and sulfate-S than did samples collected from wells constructed with plastic pipes. Rust which formed in the metal wells caused precipitation of the orthophosphate and sulfate present in groundwater. Studies to evaluate the use of galvanized metal runoff-collection tanks for nutrient loss by surface runoff experiments showed that orthophosphate-P concentration in water collected in such tanks decreased with time. No effect of time of water sampling from the runoff-collection tank on the nitrate of sulfate concentration was observed within 48 hours. (Murphy-FIRL)
W75-01627

NUMERICAL ANALYSIS ON UNSTEADY DISPERSION IN RIVER,
Osaka Univ., (Japan). Dept. of Civil Engineering.
K. Muraoka, and K. Nakatsuji.
Technology Reports of the Osaka University, Vol 23, No 1121/1154, p 649-661, April 1973. 8 fig, 1 tab, 5 ref.

Descriptors: *Water pollution, *Rivers, *Model studies, *Numerical analysis, Estuary, Planning.
Identifiers: Errors, *Unsteady dispersion, Finite difference schemes.

Numerical analysis of the concentration of diffusive materials for the prediction of water pollution in a river or its estuary are needed. Numerical errors of some finite difference schemes were quantitatively evaluated. It was found that the finite difference scheme with the accuracy of fourth order gives the satisfactory results of approximation and is also free from the restriction of selection of mesh size at the difference scehem. (Prague-FIRL)
W75-01646

5C. Effects Of Pollution

ZONES OF NITRIFICATION,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W75-01103

PRELIMINARY STUDIES ON THE PRIMARY PRODUCTION AND ITS RELATION TO FISHERIES OF THE PULICAT LAKE,
Central Inland Fisheries Research Inst., Madras (India).
M. Kaliyamurthy.
Indian J Anim Sci. Vol 43, No 3, p 238-242. 1973, Illus.
Identifiers: Fisheries, *India(Pulicat Lake), Lakes, Light, Monsoons, *Phytoplankton, *Primary production.

Observations made during June 1968-June 1969 on the gross primary production of the Pulicat lake (India) showed that the rate from 312-2500 mgC/m2/day. The premonsoon months were the most productive, followed by summer, post-monsoon and monsoon in the order mentioned. A close correlation between light penetration, phytoplankton standing crop and gross primary production was observed. No direct effect of temperature and salinity on primary production was noticed. The annual production of the lake was computed as 312 gC/m2/year. Only 0.094% of the primary produc-

tion appeared to contribute to the harvest from the lake in the form of fish. Since plankton-feeding fish in the lake form only a minority, it appears that a considerable portion of the production contributes to the secondary production.--Copyright 1974, Biological Abstracts, Inc.
W75-01105

A NEW METHOD FOR ESTIMATING PRODUCTIVITY IN STANDING WATERS USING FREE OXYGEN MEASUREMENTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W75-01107

INFLUENCE OF SEVERAL ALGAE ON 2,4-D RESIDUES IN WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Department of Plant Pathology and Physiology.
For primary bibliographic entry see Field 5G.
W75-01108

CAM IN TILLANDSIA USNEOIDES: STUDIES ON THE PATHWAY OF CARBON AND THE DEPENDENCY OF CO2 EXCHANGE ON LIGHT INTENSITY, TEMPERATURE AND WATER CONTENT OF THE PLANT, (IN GERMAN),
Technische Universitaet, Munich (West Germany). Botanisches Institut.
For primary bibliographic entry see Field 2I.
W75-01113

A THEORETICAL APPROACH TO INTERSPECIFIC COMPETITION IN PHYTOPLANKTON COMMUNITIES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2I.
W75-01114

EFFECTS OF A POWER PLANT ON ZOOPLANKTON DISTRIBUTION AND ABUNDANCE NEAR PLANT'S EFFLUENT,
Wisconsin Univ., Madison. Dept. of Zoology.
G. A. Brauer, W. H. Neill, and J. J. Magnuson.
Water Research, Vol 8, No 7, p 485-489, 1974. 5 fig, 10 ref. OWRT-B-028-WIS(4). 14-01-0001-1870.

Descriptors: *Zooplankton, *Powerplants, *Cooling water, Water circulation, Electric power, Methodology, Water pollution sources, Discharge(Water), Lakes, Temperatures, *Thermal pollution, Heated water, *Wisconsin.
Identifiers: *Lake Monona(Wis), Hyalella azteca.

A power station on Lake Monona, Wisconsin, draws cooling water from two intakes 110m offshore and discharges the water at two shoreline outfalls 200m apart. The density of zooplankton near these outfalls was 2-7 times greater than at littoral reference stations because zooplankton density at the limnetic intakes was consistently higher than in littoral reference areas. Thus, the circulation of cooling water transported zooplankton-rich water to the littoral zone. (Katz)
W75-01123

ORGANIC ENRICHMENT WITH LEAF LEACHATE IN EXPERIMENTAL LOTIC ECOSYSTEMS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins, J. J. Klug, R. G. Wetzel, R. C. Peterson, and K. F. Suberhoff.
BioScience, Vol 22, No 12, p 719-722, 1972. 3 fig, 1 tab, 16 ref. OWRR B-019-MICH(12).

Descriptors: *Organic matter, *Leaves, *Lotic environment, Leachate, Water pollution effects, Chemical properties, Decomposing organic matter, Bacteria, Water pollution sources.

Stream deterioration may often be due not only to large absolute amounts and high rates of organic inputs but also to the lack of sufficient chemical diversity of the inputs. Fate of natural complex dissolved organic matter (leaf leachate) introduced into simulated natural streams as a pulse of sufficient magnitude to be classed as a major perturbation was investigated. Two large, temperature, light and flow controlled, recirculating channels designed to interface simplified laboratory culture experiments with the full complexity of natural streams were used. After an initial measurement period, dried and preweighed leaves enclosed in nylon screen bags were placed in the upstream reservoir of the laboratory stream. Results indicated the rapidity and thoroughness with which natural leachate can be processed. Dissolved organic matter reduction was probably attributable to physical flocculation, increased production of animal benthos mediated through increased bacterial densities and, primarily microbial metabolism. Successful stream management that allows for the maintenance of organism diversity lies in qualitative, quantitative, and rate manipulations of dissolved and particulate organic matter, accomplished by taking advantage of the extensive processing capacity that is a basic feature of diverse heterotrophic streams without destroying that diversity upon which the efficiency of such streams depends. (Jones-Wisconsin)
W75-01128

INFORMATION GENERATION AND COMMUNICATION TO ESTABLISH ENVIRONMENTAL QUALITY OBJECTIVES,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 6G.
W75-01130

RELATIONSHIPS BETWEEN THE FLUORIDE AND MAGNESIUM CONCENTRATIONS IN DRINKING WATER AND SOME COMPONENTS IN SERUM RELATED TO CARDIOVASCULAR DISEASES IN MEN FROM FOUR RURAL DISTRICTS IN FINLAND,
Helsinki Univ. (Finland). Dept. of Dentistry.
H. Luoma, S. K. J. Helminen, H. Ranta, I. Rytomaa, and J. H. Meurman.
Scand J Clin Lab Invest. Vol 32, No 3, p 217-224. 1973.
Identifiers: *Cardiovascular diseases, *Finland, *Fluorides, Glycerides, *Magnesium, Potassium, Rural areas, Serum, Vascular, Potable water.

An attempt was made to check some safety aspects in the increased intake of fluorides which may become current in association with the use of fluoride additions to sugar products for prevention of dental caries. A total of 300 men from 4 rural districts supplied blood samples and samples of their household drinking water (derived mainly from wells) and answered questionnaires including questions on circulatory diseases diagnosed by a physician. There was a 50-fold difference between the mean water fluoride concentrations in the extreme districts (from 0.05-2.57 ppm). The water Mg varied parallelly with the fluoride, but there was only a 2-fold difference between the means of the extreme districts. A high mean of serum K was found in the district showing the lowest means of water fluoride and Mg. A highly significant negative correlation was found between serum K and water fluoride (152 samples of blood and water from 3 districts). The percentage of men with heart and other circulatory diseases was lowest in the district showing the highest water fluoride and Mg concentrations and highest in the district with the lowest averages for these water elements. Serum triglycerides were elevated in the smokers.--Copyright 1974, Biological Abstracts, Inc.
W75-01133

I-90 LAKE WASHINGTON CIRCULATION STUDY.
Cornell, Howland, Hayes and Merryfield, Bellevue, Wash.
For primary bibliographic entry see Field 5G.
W75-01134

FREEWAY RUNOFF FROM THE I-90 CORRIDOR,
Municipality of Metropolitan Seattle, Wash.
G. Farris, R. Dalseg, and P. Machno.
May 15, 1973. 75 p, 10 fig, 22 tab, 21 ref.

Descriptors: *Surface runoff, *Water pollution effects, *Highway effects, *Road construction, *Water quality, *On-site data collections, Runoff, Pollutant identification, Storm runoff, Storm water, Eutrophication, Washington, Surface drainage, Hydrologic data, Water pollution control, Water pollution sources.
Identifiers: *Lake Washington, *Seattle, Highway drainage.

At the request of the Washington State Department of Highways, the Municipality of Metropolitan Seattle conducted a field survey on the quality and quantity of stormwater runoff from various I-90 freeway facilities in the Seattle-North Bend area. The loadings or total amount of pollutants, represented by this discharge were calculated and then related to possible effects on the receiving waters. Stormwater runoff quality was measured at three sites: The Lacey V. Murrow Bridge, South Bellevue, and North Bend. The quality of the stormwater runoff from freeway surfaces in the I-90 Corridor was found to be similar to those of other highway systems and to local urban drainage. Significant concentrations of suspended solids, oil, BOD, COD, coliform organisms, particulate phosphate and lead were recorded. No significant change in Lake Washington water quality from present discharges is indicated because lake dispersion is sufficient to dilute the pollutants to an acceptable concentration level. New construction areas, such as the site of the Eastgate Interchange, produce high solids and oil loading in stormwater runoff which could degrade the receiving waters if precautions are not taken. In the North Bend area, a high pollutant washoff rate is indicated; but it should produce minimal problems if runoff water is directed to and infiltrates the soils adjacent to the highway. Drainage to water systems, particularly small streams, may result in shoaling and oil contamination. Recommendations are given for minimizing water quality problems from the highway runoff. These include road sweeping, control of erosion during road construction, and providing sufficient dilution of runoff. (Poertner)
W75-01135

WATER AND SEWER PLAN FOR CALHOUN, DEWITT, GOLIAD, JACKSON AND VICTORIA COUNTIES.
Golden Crescent Council of Governments, Victoria, Tex.
November 1972. 229 p, 38 fig, 33 tab, 28 ref.

Descriptors: *Water supply, *Waste water treatment, *Planning, *Texas, *Sewerage, Long-term planning, Municipal water, Regional development, Regional analysis, Gulf Coastal Plain, Water pollution control, Groundwater, Septic tanks.

A plan was developed to provide a basis for future proposals and to promote efficient and orderly development of water and sewer systems. The purpose is to avoid over-design or under-design and duplication of effort. Anticipated needs are identified for water and sewer facilities in rural areas and cities under 5,500 population (1960 census). The study area includes the following five Texas counties: Calhoun, DeWitt, Goliad, Jackson and Victoria. This area lies along the middle Gulf Coast, north of the San Antonia and Matagorda Bay areas. The first phase of the Golden

Crescent's Rural Water and Sewer Study presents background on the area, covering demography, geography, the economy, and other factors on the five-county area. This phase covers the regional water and sewer plan, which deals with an inventory and analysis of all existing water and sewer systems as well as proposals for additional or new systems where 'needed' and economically feasible. The term 'need', as used in this context, refers to: (1) provisions of service where lacking; (2) improvement of services where they are inadequate; and (3) correction, replacement, or improvement of facilities that do not meet health and water quality standards. The areawide water and sewer plan is a broad conceptual plan to guide future development. By its nature, this study does not attempt to accomplish a detailed engineering study. It does attempt to show where problems are indicated, either in the near future or over a long-term growth period. Water and sewer systems are not proposed for all communities as the cost in some instances would be economical prohibitive. (Poertner)
W75-01136

DIEL VARIATION IN OXYGEN PRODUCTION AND UPTAKE IN A MICROBENTHIC LITTORAL COMMUNITY OF A NUTRIENT-POOR LAKE,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
C. Hunding.
Oikos. Vol 24, No 3, p 352-360, 1973, Illus.
Identifiers: Algae, Alminds, Bacteria, *Benthic communities, *Denmark(Lake Almindso), *Diel variation, Inhibition, Lakes, Littoral, Nutrients, Oxidation, *Oxygen production, Absorption, Photooxidation.

Variation in O2 production and uptake was studied during 24 h in a shallow-water sandy beach of Lake Almindso, Denmark, by both the light-dark bottle O2 method and by following O2 changes in the free water over the sediment. Measured changes by the 2 methods were almost identical. During the 24-h study, gross O2 production amounted to 336 mg O2 x m(-2) x day(-1), while community O2 uptake was 446 mg O2 x m(-2) x day(-1). During the light period, the relation between gross O2 production and illumination intensity varied considerably; O2 production before noon was about twice the production after noon. Similarly, a diel variation in community O2 uptake was observed, ranging from about 7 mg O2 x m(-2) x h(-1) to more than 80 mg O2 x m(-2) x h(-1) at sunset. The relatively simple and homogeneous structure of the community permitted a consideration of the effect of algal photoinhibition and photooxidation and bacterial respiration in the decomposition processes of organic substances, on the measured metabolic changes.--Copyright 1974, Biological Abstracts, Inc.
W75-01143

A SECOND SURVEY OF INVERTEBRATES AND ALGAE ALONG THE INTERTIDAL BEACHES OF WEST POINT, THE SITE OF METRO'S SEWAGE TREATMENT PLANT, SEATTLE, WASHINGTON,
Washington Univ., Seattle. Coll. of Fisheries.
K. K. Chew, J. H. Beattie, D. R. Bryson, P. J. Clark, and R. S. Grischkowsky.
October 1973, 52 p, 8 fig, 6 tab, 14 ref.

Descriptors: *Invertebrates, *Algae, *On-site data collections, *Beaches, *Intertidal areas, *Baseline studies, Waste water disposal, Assays, Sampling, Statistics, Surveys.
Identifiers: *Seattle, *Puget Sound, Macrofauna, Macroflora, Polychaetes.

A second survey was conducted for procurement of some general knowledge of the macrofauna and algal macroflora inhabiting the intertidal area of West Point, the site of a sewage treatment plant operated by the Municipality of Metropolitan Seattle (METRO). A comparison of the different groups and types of animals present in 1971 and 1973 indicated a similar number of varieties for the intertidal sampling stations along the transects (exclusive of the rock sea wall). There were more stations with polychaetes in 1973 than in 1971 along the north shore. In 1973, seven new species of algae were observed in the sampling. A nonparametric statistical comparison was made of the data collected in 1971 and 1973. Three tests were utilized: the sign test, the rank sign test, and the Kruskal-Wallis test. In each test the hypothesis was whether the distribution noted in 1971 was the same as that noted in 1973. It was generally concluded that changes occurred in both the north and south beaches, but that these were more pronounced in the north rather than the south. In every case but one, a significant difference, either in the number of different species or the abundance of any particular species, was noted between 1973 and 1972. Further, the tests indicated that the probability of finding a greater total number for each station for each species was greater in 1973 than 1971. The sources of this difference were discussed. (Poertner)
W75-01149

THE 1971 CHOLERA EPIDEMIC IN ZARIA, NIGERIA,
London School of Hygiene and Tropical Medicine (England).
R. Schram.
Savanna (Zaria). Vol 1, No 2, p 213-222. 1972, Illus.

Descriptors: *Public health, *Epidemics, Africa, Water supply, Human diseases.
Identifiers: *Cholera, *Nigeria.

A brief review of cholera in West Africa in 1970 and 1971 and the results of a study of 200 consecutive cases admitted to the Zaria University Hospital and its infectious diseases annex were given. These were the bacteriologically confirmed cases only (all Ogawa type El Tor strain) at the height of the epidemic. The disease was largely concentrated in the Birni (Dahomey), and brought under control within 3 mo. by rapid treatment and by preventive measures which were aided by the study. A resurgence occurred when the rains fell in 1971, but the epidemic did not recur in the same season in 1972. Age and sex distribution of patients, overcrowding, immunization, water supply and occupations were described.--Copyright 1974, Biological Abstracts, Inc.
W75-01155

NATURE OF ORGANIC DERIVATIVES OF SELECTED TOXIC METALS IN NATURAL WATERS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W75-01201

A STUDY TO PREDICT THE EFFECTS OF THERMAL ADDITIONS IN THE BAY RIVER AND NEUSE RIVER AREA OF NORTH CAROLINA,
Research Inst. of the Gulf of Maine, Portland.
D. B. Horton, and D. W. Bridges.
Available from National Technical Information Services, Springfield, Va. 22161, as PB-237 444, $4.25 in paper copy, $2.25 in microfiche. November 1973. 45 p, 14 fig, 9 tab, 16 ref. OWRT B-004-NC(13).

Descriptors: *Thermal pollution, *Baseline studies, *On-site investigations, *Benthos, *Estuaries, Rivers, Estuarine environment, Water temperature, Salinity, Dissolved oxygen, Water quality, Hydrography, Measurement, Heated water, Thermal power, Water pollution effects, *North Carolina.
Identifiers: *Neuse River(NC), *Bay River(NC), Thermal tolerance, Critical thermal maximum technique, Acclimation rate, Spot, American shad, Croaker, Blue crabs, Carolina clam, Atlantic menhaden.

A baseline study was described of temporal and spatial variations in temperature, salinity, dissolved oxygen, and density and species composition of macrobenthic invertebrates in the Neuse River estuary prior to construction of a steam electric generating station. The thermal tolerance of endemic biota including spot (Leiostomus xanthurus), croaker (Micropogon undulatus), American shad (Alosa sapidissima), Atlantic menhaden (Brevoortia tyrannus), blue crabs (Callinectes sapidus), and Carolina clam (Rangia cuneata) was also estimated by applying the Critical Thermal Maximum (CMT) technique. The CMT of menhaden was used to construct a model for predicting when thermal additions as from a power plant would endanger estuarine fish. During the summer when normal shallow water temperatures are 30-32C, thermal additions must be carefully controlled so that temperature increases across a power plant heat exchanger would be limited to 3-5C. (Humphreys-ISWS)
W75-01208

INDUSTRIAL AND MUNICIPAL WASTES: ACTION OF SOME WATER SOLUBLE POLLUTANTS ON FISH,
Michigan State Univ., East Lansing. Dept. of Physiology.
P. O. Fromm, and K. R. Olson.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 428, $3.25 in paper copy, $2.25 in microfiche. Completion Report Institute of Water Research, Michigan State University, November 1973. 22 p, 10 fig, 10 ref. OWRT A-064-MICH(3). 14-31-0001-3822.

Descriptors: *Industrial wastes, *Municipal wastes, *Rainbow trout, Pollutants, Fish, *Mercury, Chlorides, Ions, Sodium, Potassium, Chlorine, Sulfur, *Electron microscopy, Absorption.
Identifiers: Gill cartilage, Epithelial cells, Secondary lamellae, Tissue scans.

The purpose was to observe some of the more subtle effects of pollutants on the gill blood-water barrier using gill epithelia as the target organ. Electron microscopic techniques, including Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and Electron Microprobe Analysis were used to study changes in gill ultrastructure and ion distribution in gills following exposure of rainbow trout to different water soluble pollutants. Two of these techniques, scanning electron microscopy and electron microprobe analysis have never before been applied to gill ultrastructure analysis and thus studies on gills from 'control' fish utilizing these techniques have proven useful in understanding of the functional anatomy of this organ. The report consists of three separate articles: (1)'A scanning electron microscopic study of secondary lamellae and chloride cells of rainbow trout (Salmo gairdneri)'. (2) 'Mercury uptake and ion distribution in gills of rainbow trout (Salmo gairdneri: Tissue scans with an electron microprobe,' and (3) 'Effects of mercury exposure on rainbow trout gill ultrastructure.'
W75-01215

HEAVY METAL CONCENTRATION IN FISH TISSUE OF THE UPPER CLARK FORK RIVER,
Montana Univ., Missoula. Dept. of Chemistry.
W. P. Van Meter.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 429, $3.75 in paper copy, $2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No. 55, August 1974. 38 p, 4 fig, 8 tab, 13 ref, 2 append. OWRT A-053-MONT(1).

Descriptors: Water quality, *Mine wastes, *Heavy metals, Fish conservation, *Montana, Water pollution sources, *Spectroscopy, *Pollutant identification, Water pollution effects, *Mercury, *Cadmium, Copper, Lead, Zinc.
Identifiers: Carius method, Processing of biological materials, *Upper Clark Fork River(Mont).

Specimens of game and rough fish from the upper Clark Fork River basin of Western Montana have been analyzed by Atomic Absorption Spectroscopy for cadmium, copper, lead, mercury, and zinc. Both muscle and liver tissue were analyzed. Procedures for the analyses are described in detail, including a sealed Pyrex tube method for the wet digestion of fresh tissue samples. Parts of the Flint Creek drainage are contaminated with mercury. Muscle concentrations in trout ranged up to 1.9 ppm. The mercury results from silver ore processing in the 19th century by the pan amalgamation method. Elevated levels of cadmium were found in one stream, the Little Blackfoot River, but no apparent source can now be identified. Tissue concentrations are interpreted in terms of the Provisional Tolerable Weekly Intake concept advanced by the FAO/WHO Expert Committee on Food Additives. (Williams-Montana State)
W75-01216

ISOLATES OF PENICILLIUM, ASPERGILLUS, AND TRICHODERMA TOXIC TO AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, and C. Y. Lin.
Hyacinth Control Journal, Volume 12, May 1974, p 70-73. 2 fig, 1 tab, 8 ref. OWRT A-027-FLA(2). 14-31-0001-4009.

Descriptors: *Water pollution effects, *Aquatic plants, Isolation, Biocontrol, Aquatic weed control, Toxicity, Plant pathology, Toxins.
Identifiers: Penicillium, Aspergillus, Trichoderma.

Species of Penicillium, Aspergillus, and Trichoderma were commonly found associated with rotten or chlorotic specimens of hydrilla (Hydrilla verticillata Royle) in Florida and India. In laboratory inoculation tests with 30 isolates of these genera, 12 caused chlorotic damage on hydrilla and subsequent lysis. All 12 produced toxic substances in liquid cultures; in four of them, oxalic acid was identified as the toxin. The nature of toxins in the other eight isolates is being investigated. At the minimal concentration needed to kill hydrilla, pure as well as fungal oxalic acids were also toxic to four species of fish (lethal) and twelve species of aquatic plants tested. The degree of damage varied with the type of plant. The possible usefulness of phytotoxic microbial metabolites in biocontrol of aquatic weeds is discussed. (Morgan-Florida)
W75-01225

SULFATE UPTAKE AS A MEASURE OF PLANKTONIC MICROBIAL PRODUCTION IN FRESHWATER ECOSYSTEMS,
Wayne State Univ., Detroit, Mich. Dept. of Biology.
R. H. Monheimer.
Canadian Journal of Microbiology, Vol 20, No 6, 1974, p 825-831. 3 fig, 3 tab, 17 ref. OWRT A-060-MICH(2). 14-31-0001-3522.

Descriptors: *Sulfates, Production, Ecosystems, Sulfur, Photosynthesis, *Michigan, Microbial degradation, Absorption, Plankton, Bioindicators, Biomass, Water pollution effects.
Identifiers: *Microbial community production, Carbon fixation, Sulfate uptake rates, *Plankton production, *Lake St. Clair(Mich), Soy peptone powder.

A method is needed by which biomass production resulting from nonphotosynthetic micro-organisms in natural aquatic ecosystems can be included in microbial production measurements. Both laboratory cultures and field samples were used for examining the suitability of measuring sulfate uptake as a yardstick of microbial production. Sulfate uptake, using 35 SO4, was compared with 14 CO2 uptake and it was found that sulfate uptake measures significantly more microbial production than does 14 CO2 uptake. With further study, the use of sulfate uptake may become a very satisfactory method for better estimating the total planktonic microbial production under aerobic conditions.
W75-01229

SOURCES OF NITROGEN AND PHOSPHORUS IN THE LAKE GEORGE DRAINAGE BASIN: A DOUBLE LAKE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 5B.
W75-01235

BIOACCUMULATION AND TRANSFER OF 14C-DDT IN A SMALL POND ECOSYSTEM,
Helsinki Univ. (Finland). Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W75-01236

AMINO ACID COMPOSITION OF FRESHWATER ALGAE,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Arch Hydrobiol, Vol 72, No 1, p 1-9, 1973.
Identifiers: *Algae, *Amino acids, Anabaena circinalis, Aphanizomenon flos aquae, Chara braunii, Chara fibrosa, Chara vulgaris, Consumer, Decomposer, Dictyosphaerium pulchellum, Euglena proxima, Hydrodictyon reticulatum, Microcystis aeruginosa, Nitella sp, Organisms, Pithophora kewensis, *Protein, Rhizoclonium hieroglyphicum, Spirogyra sp.

The protein content of 13 spp. of freshwater algae (Euglena proxima, Dictyosphaerium pulchellum, Chara vulgaris, C. braunii, C. fibrosa, Nitella sp., Spirogyra sp., Pithophora kewensis, Hydrodictyon reticulatum, Rhizoclonium hieroglyphicum, Anabaena circinalis, Microcystis aeruginosa and Aphanizomenon flos-agrae) ranged from 10.50-46.35 g/100 g dry weight. Proportions of individual amino acids in the protein of the different species were remarkably similar. Differences in protein content will influence the efficiency with which algal tissues are utilized by consumer and decomposer organisms --Copyright 1974, Biological Abstracts, Inc.
W75-01238

ZINC, CADMIUM, COPPER AND MANGANESE IN SPECIES OF FINFISH AND SHELLFISH CAUGHT IN THE DERWENT ESTUARY, TASMANIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
I. J. Eustace.
Australian Journal of Marine and Freshwater Research, Vol 25, No 2, p209-220, August 1974. 1 fig, 3 tab, 25 ref.

Descriptors: *Water pollution, *Heavy metals, *Marine fish, *Mollusks, *Australia, Water pollution effects, Pollutants, Zinc, Cadmium, Copper, Manganese, Elasmobranches, Teleosts, Fish types, Fish food organisms, Oysters, Mussels, Monitoring, Bioassay, Estuaries.
Identifiers: *Water pollution index, *Tasmania, *Derwent River(Aust), Food regulations.

Thirty-nine marine species, including members of the Teleostomi and Elasmobranchii, were obtained from the River Derwent, Tasmania, Australia, and Analyzed for four heavy metals known to be accumulated by certain species, particularly molluscs. The muscle tissues from edible Teleostomi and Elasmobranchii contained levels of zinc, cadmium and copper well below the maximum levels permitted by current Tasmanian food regulations. Manganese levels were also low. Small species differences for zinc and copper levels in muscle tissue are probably attributable to differences in feeding habits. With some minor exceptions no relationships existed between the tissue metal levels and length of the fish. Two edible species of molluscs, the native oyster and the common mussel, contained much higher levels of the four metals. For both species the levels of zinc and cadmium exceeded the levels specified by the food regulations. The results indicate that the ability of molluscs to accumulate certain metals to abnormally high levels is not shared by finfish species. The monitoring of commercial fish species caught in the river would provide a much less sensitive index of pollution than would the monitoring of oysters or mussels. (CSIRO)
W75-01243

ADVANCED WASTE WATER TREATMENT,
Canberra Housing and Construction Dept. (Australia). Major Development Section.
For primary bibliographic entry see Field 5D.
W75-01248

BIOASSAY PROCEDURES AND SUBLETHAL EFFECT STUDIES WITH FULL BLEACHED KRAFT PULP MILL EFFLUENT AND PACIFIC SALMON,
Fisheries Research Board of Canada, West Vancouver (British Columbia).
J. C. Davis.
Canadian Pulp and Paper Association, Technical Section, Papers and Discussions, No 1, p D13-D16, July 1974. 3 fig, 1 tab, 31 ref.

Descriptors: *Fish, *Toxicity, *Bioassay, *Pulp wastes, *Water pollution effects, *Bleaching wastes, Waste water(Pollution), Salmon, Fish behavior, Fish physiology, Respiration, Animal growth, Flow rate, Aquatic life, Water quality standards.
Identifiers: Sublethal effects, Kraft mills, Bleach plants.

Details of bioassay procedures for evaluating sublethal effects of bleached kraft mill effluents on salmon are described, including sample collection, storage, and aeration, fish density in test tanks, and static vs dynamic (continuous-flow) tests. A rapid method for estimating 4-day LC50 (TLM96) from median survival time data is proposed. Sublethal effluent effects on respiration, circulation, growth, behavior, and blood chemistry are summarized. The threshold for most responses appeared to be 0.1-0.2 of the 4-day LC50. The significance of these findings in the light of existing and proposed effluent discharge standards is discussed. (Brown-IPC)
W75-01281

USE OF DRIED SLUDGE FROM PAPER PROCESSING WASTES IN TROUT DIETS,
Bureau Sport Fisheries and Wildlife, Spearfish, S.D. Diet Testing Development Center.
L. E. Orme, and C. A. Lemm.
Feedstuffs, Vol 45, No 51, p 28, 30, Dec. 10, 1973. 5 tab, 9 ref.

Descriptors: *Fish diets, *Sludge, *Pulp wastes, Trout, *Rainbow trout, Activated sludge, *Bacteria, *Toxicity, *Bioassay, *Proteins, Industrial wastes, Ultimate disposal, Growth rates, Animal growth, Animal metabolism, Carbohydrates.

In bioassays lasting 265 days, rainbow trout were fed diets containing zero, 25%, or 50% of dried sludge obtained from paper mill effluents. The sludge was essentially bacterial cell debris produced in an activated sludge treatment plant

and comprised 42% protein plus polysaccharides and inorganic matter. The trout fed well on the diets. Feed conversion increased and growth rate decreased as the dried sludge proportion was increased (at the expense of herring meal). Mortality was low and similar in all groups. No abnormalities or deficiencies were found. The dried sludge was free of pathogens and not hazardous to either fish or humans. (Buchanan-IPC)
W75-01283

EFFECT OF MOSQUITO CONTROL CHEMICALS ON AQUATIC FAUNA,
Arkansas Univ., Fayetteville. Dept. of Entomology.
J. L. Lancaster, Jr., and M. V. Meisch.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 518, $3.75 in paper copy, $2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, 1974. 32 p, 2 fig, 6 tab, 30 ref. OWRT A-018-ARK(2). 14-31-0001-3804.

Descriptors: Water pollution effects, *Arkansas, *Insecticides, *Larvicides, Aquatic environment, Mosquitoes, *Insect control, Rice, Aquatic animals.
Identifiers: *Mosquito control, Thermal fogging.

For the three year period, 1970-1972, the community of Lonoke, Arkansas, has been the site of a mosquito control demonstration. The project demonstrated that mosquito numbers could be reduced within the budget of a ricefield community. The program consisted of larviciding mosquito breeding sites with a 2-sq mile area with Lonoke at the center. All ricefields within an additional 2-mile zone were also larvicided. During the Lonoke study, 1,292 samples of aquatic fauna were analyzed. Reduction in numbers could be detected after treatment but recovery was also apparent. Also, when winged adults emerged, migration out of the aquatic habitat resulted. Comparison with control samples indicates considerable reduction in overall aquatic fauna in all sections. The highest percentage reduction occurred in mosquito larvae, and this attests to the effectiveness of the chemicals for mosquito control. For more effective control the abatement area should be increased at least twofold. A mosquito abatement district appears to be the ultimate solution. Many local authorities remain skeptical and it appears necessary to demonstrate the practicality of mosquito control; however, the technology for successful mosquito control in Arkansas does exist.
W75-01319

THE EFFECT OF A MUNICIPAL EFFLUENT ON THE PHYTOPLANKTON COMPOSITION AND DIVERSITY OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
S. J. Edwards.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 504, $4.25 in paper copy, $2.25 in microfiche. Master of Science Thesis, 1973. 48 p, 8 tab, 11 fig, 46 ref. OWRT A-052-CONN(2). 14-31-0001-3807.

Descriptors: *Photoplankton, Suspended solids, *Municipal wastes, Effluents, Water sampling, Biochemical oxygen demand, Nitrates, Phosphates, Diatoms, Turbidity, Water pollution effects, *Connecticut, Water pollution sources.
Identifiers: *Species diversity, Primary treatment, Nitrate nitrogen, Ortho-phosphates, Bacillariophyceae, *Willimantic/Shetucket Rivers(Conn), Natchaug River(Conn).

In the Willimantic/Shetucket Rivers, the natural ecosystem is disrupted by the discharge of municipal wastewater into the river following primary treatment. Seven sampling stations were established from which water samples were collected biweekly and analyzed for BOD, nitrate nitrogen, ortho- and total-phosphate turbidity, suspended solids, alkalinity, total phytoplankton population, and species diversity using taxonomic methods (non-Bacillariophyceae as to genus and species and Bacillariophyceae as to centric or pennate). The treatment plant was responsible for increasing ortho-phosphate and suspended solids concentrations although the other chemical parameters were not significantly affected. The confluence of the very clean Natchaug River with the Willimantic at the outfall of the treatment plant obscures part of the effect. The phytoplankton population reflected characteristic benthic populations, mostly pennate diatoms, characteristic of a clean water environment. Species diversity was not affected by the effluent; the total population, however, did increase due to the nutrient enrichment. (Deitchman-Connecticut)
W75-01322

SURVEY AND EVALUATION OF PLANT PATHOGENS OF ALLIGATORWEED (ALTERNANTHERA PHILOXEROIDES (MART.) GRISEB.),
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5G.
W75-01323

THE EFFECTS OF THERMAL ENRICHMENT ON THE MACROINVERTEBRATE POPULATIONS OF THE WABASH RIVER,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
S. T. Pierce.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 502, $4.25 in paper copy, $2.25 in microfiche. MA Thesis, May 1973. 61 p, 19 fig, 9 tab, 7 ref, append. OWRT B-031-IND(7).

Descriptors: *Invertebrates, *Aquatic insects, *Heated water, Mayflies, Thermal water, Water temperature, *Indiana, Water pollution effects, *Thermal pollution, *Diptera, Distribution patterns.
Identifiers: *Wabash River(Ind), Tricorythodes, Baetis, Isonychia, Dominance indices, Diversity indices.

A study of the effects of thermal enrichment on the macroinvertebrate populations of the Wabash River adjacent to the Cayuga electrical-generating station was undertaken during the summers of 1970, 1971, and 1972. Samples were obtained from eight zones located above and below the thermal discharge. A series of drift-net samples was taken in August 1972 in the intake and the discharge every three hours over a 24 hour period. The major macroinvertebrates involved were insect larvae of the orders Trichoptera and Diptera and the nymphs of Ephemeroptera. The Trichoptera and Chironomidae in heated areas displayed increased development rates with accelerated pupation and emergence. The mayfly Stenonema preferred warmer waters and responded with greater densities and speeded development. Tricorythodes, Baetis, and Isonychia remained unaffected by the thermal range encountered. Tricorythodes, however, displayed a strong preference for areas of low current velocities regardless of temperature. Relative densities of macroinvertebrates increased in the warmer areas, while relative dominance values decreased overall.
W75-01325

RNA TO DNA RATIOS AS INDICATORS OF METABOLIC ACTIVITY IN FISH AFFECTED BY TEMPERATURE,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
M. T. Harves.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 509, $3.75 in paper copy, $2.25 in microfiche. M.A. Thesis, August 1972. 21 p, 3 fig, 4 tab, 20 ref. OWRT B-031-IND(6).

Descriptors: *Fish physiology, *Environmental effects, *Warm water fish, Aquatic environment, Stream improvement, *Sunfishes, Growth rates, *Bioindicators, Water temperature, Metabolism, Fish diets, Water pollution effects.
Identifiers: *Ribonucleic acid, *Desoxyribonucleic acid, Gizzard shad, White crappie, RNA/DNA ratios.

Laboratory experiments with white crappie (Pomoxis annularis) showed that temperature increases metabolic activity. Fish were maintained at 18C and 25C on deprivation diets. Samples were taken at 2, 4, and 6 days and RNA to DNA ratios (from liver tissues) for each temperature were: 3.94, 3.79, 3.09 and 3.27, 2.55, and 2.46 respectively. Mean weight losses for each temperature were: 1.4, 1.4, and 2.8 gr. and 1.4, 1.4, and 5.6 gr. The initial RNA to DNA ratio was 3.98. Field experiments with gizzard shad (Dorosoma cepedianum) determined ratios of 3.50 and 3.23 for fish at mean temperatures of 21 and 27C respectively. There was, however, no statistical significance to this difference. The use of RNA to DNA ratios as a measure of metabolic activity in fish seems valid, and for gathering field data appears to be better than other methods in terms of time and usability.
W75-01326

GULL LAKE: PAST, PRESENT, FUTURE.
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5B.
W75-01327

ALTERATION OF LIPID CONTENT OF TISSUES AND GONOSOMATIC INDICES OF WHITE CRAPPIE BY THERMAL ADDITIONS IN THOMAS HILL RESERVOIR, MISSOURI,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
R. F. Knox.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 526, $4.75 in paper copy, $2.25 in microfiche. M.A. Thesis, August 1973. 71 p, 18 fig, 13 tab, 44 ref, 2 append. OWRT B-039-MO(1). 14-31-0001-3296.

Descriptors: *Thermal pollution, *Fish reproduction, Growth rates, Lipids, Gonads, *Missouri, *Sunfishes, Water pollution effects, Metabolism.
Identifiers: *Thomas Hill Reservoir(Mo), White crappie, *Gonosomatic indices.

Male and female white crappie were captured monthly, Sept., 1971-Apr., 1972, from two arms of Thomas Hill Reservoir. The Hotwater Arm received a thermal effluent that elevated the water temperature throughout the year, while the Control Arm was under a normal temperature regime. The gonads, gut, liver, and muscle tissues were analysed for total lipids, and the gonosomatic indicies were determined. At the 0.95 level of significance there was no difference in lipid content of gonads and muscle tissue of fish from the Hot Water and Control Arms. However, in the gut and liver the lipid levels were significantly less in fish from the Hotwater Arm than in those from the Control Arm. The gonosomatic indices were significantly less in fish from the Hotwater Arm than in fish from the Control Arm. It is postulated that the high rate of metabolism of fish in the Hotwater Arm during winter is responsible for these differences. The resultant effect of the thermal effluent may be reduced fecundity and recruitment to the population. (Witt-Missouri)
W75-01328

EVALUATION OF CRITERIA FOR DETERMINING LIMITING NUTRIENTS IN SURFACE WATERS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5A.
W75-01332

EFFECTS OF TEMPERATURE ON THE TOXICITY OF OIL REFINERY WASTE, SODIUM CHLORATE, AND TREATED SEWAGE TO FATHEAD MINNOWS,
Utah Water Research Lab., Logan.
C. C. Shifrer, E. J. Middlebrooks, D. B. Porcella, and W. F. Sigler.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 516, $4.75 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Report PRWG 105-4, September 1974. 79 p, 18 fig, 19 tab, 45 ref, 6 append. OWRT B-070-UTAH(6). 14-31-0001-3659.

Descriptors: *Bioassay, *Lethal limit, *Temperature, Toxicity, Oil wastes, Phenols, *Sewage effluents, Water pollution effects, Sewage treatment, *Reviews, Minnows.
Identifiers: Physical chemical treatment, *Sodium chlorate, Literature reviews, *Fathead minnows.

A literature review and experiments were conducted to determine the effects of temperature on the toxicity of three materials to fish (fathead minnows, Pimephales promelas, Rafinesque). These three toxicants (oil refinery waste, sodium chlorate, and treated sewage) were studied at different temperatures using standard static bioassay techniques. The treated sewage was generated by a compact zero discharge treatment system which will disinfect, remove suspended solids, and remove oxygen demanding materials by physical and chemical means. Pnenol was found to exert 40 percent of the total toxic action exerted at the TL50 concentration for the oil refinery waste assuming that the toxicities of all substances in the oil refinery waste were additive. Sodium chlorate and sodium chloride were found to exert less than 35 percent of the total toxic action exerted at the TL50 concentration for the treated sewage, assuming that the toxicities of all substances in the treated sewage were additive. From the comparison of median lethal times, found at different temperatures, the mode of toxic action was predicted for each toxicant.
W75-01333

EFFECTS OF CHRONIC OIL CONTAMINATION ON AQUATIC DIPTERANS: A STATE OF THE ART REPORT,
Vermont Univ., Burlington. Dept. of Entomology.
B. L. Parker, and J. D. Brammer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 499, $3.75 in paper copy, $2.25 in microfiche. Vermont Water Resources Research Center, Burlington, Completion Report, June 1974. 32 p, 1 fig, 2 tab, 59 ref. OWRT A-018-VT(1). 14-31-1-4046.

Descriptors: *Oil pollution, Toxicity, Gas chromatography, *Mosquitoes, Aquatic insects, *Vermont, *Diptera, *Reviews, Bibliographies, *Research priorities, Water pollution sources, Water pollution effects.
Identifiers: *Lake Champlain(Vt).

A literature search was conducted to prepare a state of the art report and to determine research needs in the area of petroleum pollution in aquatic environments. Oil contamination of marine freshwater habitats was reviewed. Sources of petroleum pollution in Lake Champlain were stressed. The biological (toxic, behavioral, physiological) effects of oil contamination on marine and aquatic organisms were examined with special emphasis on aquatic stages of mosquitoes. Fluorescence spectrophotometry, mass spectrometry, and gas chromatography were discussed as methods useful in detection of petroleum fractions in water. Gas liquid chromatography was the most widely used method for both qualitative and quantitative analysis. Petroleum fractions which may be soluble in lake water were reported to include paraffins, olefins, naphthenes, and aromatic hydrocarbons such as benzene, styrene, and cumene. Low molecular weight aromatics were reported to be most toxic to aquatic organisms. No research was found on the effects of low-level, chronic oil contamination on aquatic insects. Research needs include: mechanisms of uptake and transport of hydrocarbons, physiological and morphological effects, and the effects of petroleum fractions on reproductive potential and other population parameters of aquatic organisms, especially insects. The literature search resulted in a compiled bibliography of 163 selected references. (Berry-Vermont)
W75-01336

EUTROPHICATION: A MATHEMATICAL MODEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. H. Friedman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 529, $4.25 in paper copy, $2.25 in microfiche. Technical Report No 21, June 1973. 49 p, 2 fig, 30 ref, append. A-036-ARIZ(2). 14-31-0001-3803.

Descriptors: *Mathematical models, Biological properties, Epilimnion, Environmental effects, Growth rates, Photosynthesis, Effluents, *Eutrophication, Indicators, Productivity, *Stochastic processes, *Model studies, Bioindicators, *Nutrient requirements, *Phytoplankton, *Zooplankton, Monte Carlo method.
Identifiers: Stochastic water quality model, Algal growth rate.

Various approaches to modeling phytoplankton-zooplankton-nutrient interactions have been investigated. A stochastic birth-death model was developed to describe changes in phytoplankton and zooplankton population levels at a given point. The stochastic birth-death model was combined with a deterministic mass balance of limiting nutrient concentration to form an over-all system theoretic model that enables one to use Monte Carlo simulation to study the problem of eutrophication. A comparison made between this modeling approach and the standard differential equation approach suggested that further investigation was desirable, particularly in the area of model calibration.
W75-01385

COMPARATIVE EVALUATION OF TWO METHODS OF CALCULATING PRODUCTION EXEMPLIFIED BY THE ZOOPLANKTON OF LAKE ILMEN, (IN RUSSIAN),
L. A. Stepanova.
Ekologiya. Vol 4, No 6, p 18-25. 1973. Illus.
Identifiers: Bosmina-coregoni, Chydorus-sphaericus, Daphnia-cucullata, Eudiaptomus-graciloides, Lakes, Mesocyclops-leuckarti, *Plankton production, Reproduction, Russian-SFSR, Sida-crystallina, *USSR(Lake Ilmen), *Zooplankton, *Lakes.

The production of dominant forms of zooplankton (Mesocyclops leuckarti, Eudiaptomus graciloides, Daphnia cucullata, Bosmina coregoni, Chydorus sphaericus, Sida crystallina) in Lake Ilmen (Russian SFSR, USSR) were calculated by 2 methods from the data of hydrobiological observations: based on the rate of body weight gain and the rate of reproduction. A critical analysis of the principles of the 2nd method is given. The main determinants of the deviation of the value of the increase of production and the production/biomass relation calculated by the 2nd method are: the different average weight of the eliminated individuals and of the individuals forming the population; and the deviation of the number of egg-laying females at the time of observation from their average number during the period for which the production is calculated.--Copyright 1974, Biological Abstracts, Inc.
W75-01394

A CONTINUOUS FLOW KINETIC MODEL TO PREDICT THE EFFECTS OF TEMPERATURE ON THE TOXICITY OF OIL REFINERY WASTE TO ALGAE,
Utah Water Research Lab., Logan.
J. H. Reynolds, E. J. Middlebrooks, and D. B. Porcella.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 699, $3.75 in paper copy, $2.25 in microfiche. Research Report, (1973). 42 p, 9 fig, 16 tab, 57 ref. OWRR B-070-UTAH(2). 14-31-0001-3659.

Descriptors: Water pollution effects, *Bioassay, *Toxicity, Bioindicators, Industrial wastes, *Phenols, *Kinetics, Mathematical models, *Algae, Temperature, *Thermal pollution, *Oil wastes, Inhibition, Enzymes.
Identifiers: Chemostat, Oil refinery wastes, Enzyme inhibition, Selenastrum capricornutum.

Many industries, such as pulp and paper mills, tanneries, and oil refineries, discharge toxic wastes at extremely high temperatures. The temperature of an oil refinery waste may range from 22C (71F) to 41C (106F). These high temperatures could have a significant effect on the toxicity of a given waste. It is therefore necessary to develop relationships which will evaluate and predict the effects of increased temperature on the toxicity of various wastes. Equations have been developed utilizing continuous flow stirred tank reactor (chemostat) kinetics and enzyme inhibition kinetics to describe the effects of temperature on toxicity to microorganisms. These equations were tested by semicontinuous and continuous flow experiments with phenol and the algae Selenastrum capricornutum. The data obtained were fitted to competitive, uncompetitive, and noncompetitive inhibitor models. The results indicated that phenol exerts a competitive inhibition effect on the growth of S. capricornutum. Comparison of the competitive inhibition constants, K sub I, for S. capricornutum exposed to phenol at 20C, 24C, and 28C, indicate that phenol toxicity increases with an increase in temperature according to the Arrhenius function.
W75-01408

RESPONSES OF YOUNG GULF GRUNION, LEURESTHES SARDINA, TO GRADIENTS OF TEMPERATURE, LIGHT, TURBULENCE AND OXYGEN,
Arizona Univ., Tucson. Dept. of Biological Sciences.
W. W. Reynolds, and D. A. Thomson.
Copeia, No 3, p 747-758, October 18, 1974. 1 tab, 10 fig, 39 ref.

Descriptors: *Temperature, *Fish behavior, *Oxygen, *Turbulence, *Light, Water properties, Juvenile fish, Methodology, Equipment, Age, Habitats, Laboratory tests.
Identifiers: *Grunion, *Leuresthes sardina, *Environmental gradients, *Orientation responses, *Gulf of California, Selectron gradient device.

Young Gulf of California grunion, between 25 and 160 days post-hatching, exhibited a modal temperature preferendum of 32 degrees C. Prior to 3 weeks of age, they showed no clear temperature preference. At all ages from hatching through at least 150 days, the fish were strongly photo positive, selecting the brightest available light intensity (32000 lux). They also preferred a moderate level of turbulence, and tended to avoid oxygen concentrations below 5 ppm, as well as unnaturally high dissolved oxygen concentrations. The laboratory responses are consistent with the known distribution of juvenile Gulf of California grunion in the warm, shallow, inshore waters of the Gulf and may provide a mechanism by which they seek, and remain in, a favorable environment. (Katz)
W75-01411

SPECIES, SIZE AND AGE DISTRIBUTION IN NORTHERN DONETS FISHES IN THE AREA OF DISCHARGE OF WARM-WATER EFFLUENTS FROM THE LUGANSK POWER STATION,
Akademiya Nauk USSR, Kiev. Instytut Zoologii.
A. Ya. Schcherbukha.
Hydrobiological Journal, Vol 9, No 3, p 36-41, 1973. 4 tab, 11 ref.

Descriptors: *Heated water, *Commercial fish, *Power plants, *Distribution, *Fish populations, Water pollution effects, Fishkill, Industrial wastes, Domestic wastes, Pikes, Carp, Powerplants, Age, Environmental effects, Productivity, *Thermal pollution.
Identifiers: Tench, Bream, *USSR(Northern Donets).

The changes in the species composition of the ichthyofauna of the Northern Donets in the region of discharge of the warm water from the Lugansk Power Station are described. A relationship is demonstrated between the species of fish, their size, and their age in commercial catches. Measures are described for restoring stocks of fish in this sector of the river. (Katz)
W75-01412

PRELIMINARY SURVEY OF TOXICITY OF CHLORINATED SEWAGE TO SOCKEYE AND PINK SALMON,
International Pacific Salmon Fisheries Commission, New Westminister (British Columbia).
J. A. Servizi, and D. W. Martens.
Progress Report No 30, 1974. 47 p, 11 tab, 12 fig, 27 ref.

Descriptors: *Bioassay, *Salmon, *Toxicity, *Chlorination, *Water purification, *Sewage treatment, Water pollution sources, Pink salmon, Sockeye salmon, Lethal limit, On-site investigations, Quality control, Analytical techniques, Aerated lagoons, Microscopy, Mortality, Ammonia, Surfactants.
Identifiers: *Oncorhynchus ssp., Histopathology, Amperometric measurement, Gill pathology, *Chlorinated sewage.

In situ bioassays were conducted using sockeye salmon (Oncorhynchus nerka) and pink salmon (O. gorbuscha) to determine whether chlorinated sewage created toxic conditions in the vicinity of sewage outfalls. Chlorination increased toxicity of sewage considerably, although effluents from primary and aerated lagoon treatment systems toxic were lethal to salmon in the absence of chlorination. On the other hand, effluent from an activated sludge plant was not lethal after dechlorination by storage in a lagoon. Histopathological examination indicated damage to gills was most severe and rapid among fish exposed to chlorinated effluents, while irritation was least among gills of fish exposed to secondary effluent dechlorinated in a lagoon. Batch tests indicated chlorine residuals persisted at lethal levels for more than two days in sewage. In addition, comparison of orthofolidine and amperometric methods of measuring chlorine residual indicated the former was not sensitive enough to detect concentrations of chlorine which would be lethal. (Katz)
W75-01413

ON THE POLLUTION AND BENTHIC FAUNA OF SHOJIN-GAWA, A SMALL STREAM, IN SAPPORO, (IN JAPANESE),
Hokkaido Fish Hatchery, Sapporo (Japan).
T. Ito.
Scientific Reports of the Hakkaido Fish Hatchery, No 28, p 57-68, December 1973. 4 fig, 2 tab, 9 ref. English abstract.

Descriptors: *Biochemical oxygen demand, *Water pollution effects, *Benthic fauna, *Tubificids, Benthos, Worms, Suspended solids, Domestic wastes, Farm wastes, Organic wastes, Dissolved oxygen, Turbidity, Water quality.
Identifiers: *Tubifex tubifex, Limnodrilus hoffmeistrei, L. claparedeianus, Volcanic ash.

The chemical condition and benthic fauna of a small stream polluted by organic matter and suspended solids were studied. In the middle part of the stream the waste of pig-farms caused a decrease in the number of bottom animals with Tubifex tubifex and Spanitoma ssp. A accounting for 90 percent of the benthos. The BOD value of the water was 1-2 ppm. The number of benthic animals decreased in the part of the stream which was heavily polluted by human organic wastes. Turbidity followed a heavy rainfall because of the quarry of volcanic ash and an unpaved road adjacent to the stream. Three species of Tubificidae were found in the stream. Newly hatched T. tubifex occurred in mildly polluted sites. In heavily polluted localities, Limnodrilus hoffmeisteri and L. claparedeianus predominated. The percent occurrence of Limnodrilus was related to the BOD value and saturation percentage of dissolved oxygen. (Katz)
W75-01414

BRINE SHRIMP BIOASSAY AND SEAWATER BOD OF PETROCHEMICALS,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
K. S. Price, G. T. Waggy, and R. A. Conway.
Journal Water Pollution Control Federation, Vol 46, No 1, p 63-77, January, 1974. 6 tab, 11 fig, 17 ref.

Descriptors: *Biodegradation, *Oil, *Biochemical oxygen demand, *Water quality control, *Bioassay, *Toxicity, *Organic compounds, *Brine shrimp, *Bioindicators, Sea water, Freshwater, Laboratory tests, Oil spills, Analytical techniques, Methodology, Nitrogen, Nitrification, Dissolved oxygen, Waste water disposal, Phenols.
Identifiers: Artemia salina, Benzene, Toluene.

The biodegradability and toxicity of over 50 synthetic organic compounds of major commercial significance were evaluated in both fresh and seawater systems. Modifications of the standard BOD test were utilized and brine shrimp (Artemia salina) were used in toxicity bioassays. Results of tests indicated that the standard BOD test, with certain modifications, is a reliable technique for screening the biodegradability of soluble and marginally soluble petrochemicals in fresh and sea water with a 20-day test period. Trends in the rate and extent of degradation of petrochemicals are noted. Brine shrimp are a rapid and precise means of evaluating the acute toxocity of petrochemicals in the seawater environment. Data developed in these studies can be used to estimate the effects of accidental spills, to project oxygen demand loads on biological treatment systems, and to judge the biological treatability of petrochemical wastes containing chemicals tested. (Katz)
W75-01415

ALGAL CANCER AND ITS CAUSES-II. SEPARATION OF CARCINOGENIC COMPOUNDS FROM SEA BOTTOM MUD POLLUTED BY WASTES OF THE COAL CHEMICAL INDUSTRY, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
S. Ishio, H. Nakagawa, and T. Tomiyama.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 38, No 6, p 571-576, 1972. 2 fig, 3 tab, 4 ref. English abstract.

Descriptors: *Algae, *Plant diseases, Separation techniques, Bioassay, Laboratory tests, Marine algae, Water pollution effects, Industrial wastes, Chemical industry, *Chromatography, Mud, Sludge.
Identifiers: *Porphyra tenera, *Carcinogens, Thin layer chromatography, Japan, *Coal tar chemicals, *Algal cancer.

Acidic, basic and neutral substances were separated from bottom mud which caused cancerous growths on the leaves of Porphyra tenera. The substances were tested on young algae to determine the carcinogen. Tests revealed the carcinogenic effect of the mud to be mainly attributable to the neutrals in it. The neutrals were separated into nine fractions by repeated thin layer chromatography and two compounds were found to be carcinogenic to the algae. (Katz)
W75-01416

THE EFFECT OF COLLECTOR DRAIN EFFLUENTS FROM RICE FIELDS ON THE ZOOPLANKTON OF CERTAIN KUBAN' LAGOONS,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
S. Ye. Panchenko, and Ye. S. Proskurina.
Hydrobiological Journal, Vol 9, No 3, p 55-60, 1973. 3 fig, 4 tab, 8 ref.

Descriptors: *Lagoons, *Zooplankton, *Farm wastes, *Water quality, *Biomass, Commercial fish, Water pollution sources, Water pollution effects, Bioindicators, Pesticides, Bottom sediments, Chlorinated hydrocarbon pesticides, Crustaceans, Rotifers, Copepods.
Identifiers: *Calanipeda aquae-dulcis, Rice field effluents, Biogenic substances, *USSR(Kuban River).

The Kuban' delta lagoons are the principal natural breeding grounds for commercial fishes. The water supply of most of these lagoons comes from effluents from irrigation farming rather than the river. Observations over many years show that the lagoons which receive effluents from rice fields have a higher mineral content and a lower content of biogenic elements than lagoons receiving water only from the river. Heavy use of pesticides in rice fields is polluting the waters and bottom material of these lagoons. The transformation of the biogenic substances in the water and the content of pesticide pollution were studied. Zooplankton were used as indicators. Calanipeda aquae-dulcis predominates in the zooplankton of lagoons fed by river waters whereas in lagoons fed only by collector effluent waters the role of C. aquae-dulcis declines. In lagoons fed by both collector effluent waters and seawater the composition and biomass of zooplankton remains the same as in the other Kuban' lagoons, although the biomass in 1968 and 1969 was 4-6 times less than in 1964. The continuous entry of collector drain effluent waters into the Kuban' lagoons leads to redistribution of the predominate species and reduction in the food supply for fish. (Katz)
W75-01417

LYMPHOCYSTIS IN AGE 0 BLUEGILLS (LEPOMIS MACROCHIRUS) RELATIVE TO HEATED EFFLUENT IN LAKE MONONA, WISCONSIN,
Wisconsin Univ., Madison. Dept. of Zoology.
L. L. Petty, and J. J. Magnuson.
Journal of the Fisheries Research Board of Canada, Vol 31, No 7, p 1189-1193, July 1974. 1 fig, 16 ref.

Descriptors: *Sunfishes, *Fish diseases, Heated water, Environmental effects, Temperature, Powerplants, Animal parasites, *Wisconsin, Water pollution effects, *Thermal pollution, Viruses.
Identifiers: *Lepomis macrochirus, *Lake Monona(Wisc), *Lymphocystis, Leeches, Piscicolaria reducta, Fish virus.

The viral disease lymphocystis was more common in age 0 bluegills (Lepomis macrochirus) in an area of Lake Monona heated by a power plant outfall than in unheated reference areas. Approximately 14,000 fish collected from July through October 1971 were examined. The infection became prevalent in mid-September and attained a max-

imum incidence in early October, when 11.6% of age 0 bluegills in the heated area had lesions in comparison with 5.5% in unheated areas in late September. Infected fish were longer than uninfected fish and usually exceeded 50mm TL. Fish greater than 50mm long in the heated and unheated areas had similar lymphocystis incidence. Thus, higher lymphocystis incidence in heated waters was largely explained by the greater percentage of bluegills longer than 50mm TL in the outfall area. Leeches were more prevalent in the heated area and may have increased lymphystis incidence by creating foci for viral penetration or by acting as vectors. Slightly higher condition factors of infected than uninfected bluegills were unexplained. (Katz)
W75-01418

MERCURY AND SELECTED PESTICIDE LEVELS IN FISH AND WILDLIFE OF UTAH: I. LEVELS OF MERCURY, DDT, DDE, DIELDRIN AND PCB IN FISH,
Utah Cooperative Wildlife Research Unit, Logan.
For primary bibliographic entry see Field 5B.
W75-01420

AVOIDANCE OF AROCLOR (TRADE MARK) 1254 BY SHRIMP AND FISHES,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
D. J. Hansen, S. L. Schimmel, and E. Matthews.
Bulletin of Environmental Contamination and Toxicology, Vol 12, No 2, pp 253-256, Aug 1974. 1 tab, 11 ref.

Descriptors: *Aroclors, *Shrimp, *Fish behavior, *Polychlorinated biphenyls, *Pesticides, Laboratory tests, Minnows, Testing procedures, Toxicants, Methodology, Pink shrimp.
Identifiers: Panaeus duorarum, Palaemonetes pugio, Lagodon rhomboides, Cyprindon variegatus, Gambusia affinis, *Aroclor 1254.

Laboratory tests were conducted to determine the ability of pink shrimp (Panaeus duorarum), grass shrimp (Palaemonetes pugio), pinfish (Lagodon rhomboides), Sheepshead minnows (Cryprinodon variegatus), and mosquitofish (Gambusia affinis) to avoid concentrations of Aroclor from 0.001 to 10 mg/l. Pink shrimp and sheepshead minnows failed to avoid any of the concentrations of PCB tested while the remaining three species avoided at least one concentration. Avoidance of PCB's in estuarine environment is a matter of speculation. (Katz)
W75-01421

PRELIMINARY OBSERVATIONS ON THE EFFICACY OF A COMMERCIALLY AVAILABLE FUNGAL INHIBITOR AND ITS TOXICITY TO FISH EGGS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A. H. Auld, and J. R. Schubel.
Chesapeake Science, Vol 15, No 2, pp 115-117, June 1974. 1 tab, 3 ref.

Descriptors: *Fish eggs, *Antibiotics(Pesticides), *Fungicides, Fungi, Pesticides, Toxicity, Mortality, Bioassay, Water pollution effects.
Identifiers: *Amphotericin B, Alosa ssp.

Amphotericin B is considered as a control of fungal infestations of fish eggs. Eggs of four species were subjected to continuous level of 1 ppm and examined for fungal growth and mortality or abnormal development. Results indicate a need for further investigation before Amphotericin B is accepted as a control of fungal infestations of fish egges. (Katz)
W75-01423

EFFECT OF INORGANIC PHOSPHOROUS ON THE GROWTH RATE OF DIATOMS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
Z. Z. Finenko, and D. K. Krupatkina-Akinina.
Marine Biology, Vol 26, No 3, pp 193-201, 1974.

Descriptors: *Phosphorous, *Phosphorous compounds, *Inorganic compounds, *Growth rates, *Limiting factors, *Diatoms, Bioassay, Absorption, Algae, Phytoplankton, Aquatic algae, Reproduction, Laboratory tests, Water pollution effects.
Identifiers: *Black Sea, Chaetoceros ssp.

The effect of different inorganic phosphorous concentrations on changes in growth rates of 7 diatom species isolated from the plankton of the Black Sea is studied. All species examined increase their cell-division rate with increasing phosphorous concentration in the medium. The phosphorous concentrations have been determined above which division rate is not limited by phosphorous content in the medium. The non-limiting concentration amounts to V/Vm=0.9. In the species studied, non-limiting concentrations ranged from 1 to 30 mg p/l. The highest values were obtained for relatively large-sized species. The ratio of all surface to volume tended to be inversely related to the growth-rate limiting concentration. Based on a comparison of phosphate levels in the Black Sea with experimentally-derived rate-limiting concentrations, it is concluded that phosphorous does not limit the reproduction rate of phytoplankton in the more productive regions of the Black sea or in the lower strata of the euphotic zone. (Katz)
W75-01424

HEAVY METALS IN THE NORTHERN FUR SEAL, CALLORHINUS URSINUS, AND HARBOR SEAL, PHOCA VITULINA RICHARDI,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. E. Anas.
Fishery Bulletin, Vol 72, No 1, pp 133-137, January 1974. 3 tab, 19 ref.

Descriptors: *Mercury, *Cadmium, *Lead, *Heavy metals, Absorption, Pollutants, Food webs, Trophic level, Analytical techniques, Age.
Identifiers: *Fur seals, *Harbor seals, Bioaccumulation, Tissue analysis, Liver, Muscle.

Samples of liver, muscle and kidney from fur seal and liver from harbor seal were analyzed for total mercury. Liver and kidney of fur seals were analyzed for lead, cadmium and arsenic. All samples, taken from several locations, contained mercury, lead and cadmium. Arsenic was not detected. Mercury was highest in liver, followed by kidney, then muscle. The maximum concentration of mercury in liver was about 700 ppm in a southern California harbor seal and 170 ppm from a fur seal from the Washington coast. Concentrations of cadmium and lead were highest in the kidney (maximums of 1.8 ppm lead and 15.6 ppm cadmium) of fur seals. Concentrations of mercury did not correlate with age in muscle or kidney but did correlate with age in liver. Concentrations of cadmium and lead in liver and kidney did not correlate with age. In samples of liver collected from harbor seals, the highest concentrations of mercury were from southern California seals. (Katz)
W75-01425

SUBLETHAL EFFECT OF MALATHION OF THREE SALMONID SPECIES,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
G. Post, and R. A. Leasure.
Bulletin of Environmental Pollution and Toxicology, Vol 12, No 3, pp 312-319, September 1974. 4 tab, 8 ref.

Descriptors: *Rainbow trout, *Brook trout, *Salmonids, *Bioassay, *Insecticides, Laboratory tests, Enzymes, Biochemistry, Pesticides, Resistance, Water pollution effects.
Identifiers: *Sublethal effects, *Acetylcholinesterase, *Malathion, Coho salmon, Oncorhynchus kisutch, Salvelinus fontinalus, Physical activity index.

Rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalus) and coho salmon (Oncorhynchus kisutch) were used as test species in a study designed to determine the effect of Malathion of acetylcholinesterase (AChE). Results indicated a significant difference in susceptibility to Malathion among the three species. Coho salmon required approximately twice the concentration of Malathion to produce similar AChE reductions as did brook trout and rainbow trout. Coho salmon, inexplicably, also showed a greater ability to perform physical activity when AChE was reduced to the same level as the other two species. Recovery time of AChE levels after exposure to Malathion varied with fish species. Brook trout recovered most rapidly after at least 25 days. It is concluded that releasing Malathion into lakes and streams may result in fish lost as an indirect result of sublethal toxicity of the insecticide. (Katz)
W75-01426

CANCEROUS DISEASE OF PORPHYRA TENERA AND ITS CAUSES,
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries Chemistry.
For primary bibliographic entry see Field 5A.
W75-01427

WARMING OF THE WORLD'S WATERS BY MAN,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
D. K. Brady.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 48-57, 2 fig, 11 ref.

Descriptors: *Thermal powerplants, *Environment, *Planning, *Thermal pollution, Environmental effects, Heated water, Water temperature, Water cooling, Ecology, Biology, Water quality.

A policy of site dispersion for thermal powerplants should eventually promote larger numbers of smaller plants that would otherwise evolve from the usual economic trade-offs between economies of scale and transmission costs. Strong pressures in this direction will probably not be felt, however, until a significant ecological disruption is caused by the accidental shutdown of a very large plant. The clustering powerplants into thermal zones cannot be dealt with summarily. In relatively open receiving waters, it is probably best to disperse thermal discharge sites as much as possible. In relatively closed waters, if local recirculation can be avoided, some clustering of small plants may be desirable to maintain thermal gradients for biological reasons as well as for efficient surface cooling. A rough numerical guide was given for use in helping to distinguish between closed and open receiving waters in difficult intermediate situations. Concerning condenser system design for a particular plant capacity at a given site, a theoretical accounting of pertinent biological factors lead to the conclusion that maximum ecological damage may result from a typical non-extreme condenser design, and that improvements might be achieved by shifting to either a high-Q low-T condenser or vice versa. In particular, if pumping damage is shown to be a significant factor, then a low-Q high-T condenser may yield the best combination overall. (See also W75-01428) (Humphreys-ISWS)
W75-01432

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens.
For primary bibliographic entry see Field 5B.
W75-01435

EFFECTS OF ACIDIFICATION OF SWEDISH LAKES,
Institute of Freshwater Research, Drottningholm (Sweden).
B. Almer, W. Dickson, C. Ekstrom, E. Hornstrom, and U. Miller.
Ambio, Vol 3, No 1, p 30-36, 1974, Illus.
Identifiers: *Acidification, Algae, *Daphnians, *Diatoms, *Fish, Lakes, Minnow, Perch, Pike, Plankton, Roach, Seasonal, Sulfates, Trout, Zooplankton, Chlorophyta, *Sweden, Water pollution effects, Hydrogen ion concentration.

The acidification of lakes in the Swedish west coast region is described. Some 3000 lakes are located in an area within 80 km from the coast. Investigations were made in nearly 400 of these in 1970-1972. Half of the lakes investigated had pH values below 6.0. In the autumn and spring 36-22% of the lakes had pH values lower than 5.0. This would correspond to 1100-700 lakes in this area. The acidification has accelerated th last 2 or 3 decades. In some lakes the pH was lowered by as much as 1.8 pH units. In addition, the sulfate content has increased in proportion to observed increased depositions. The pH decrease has caused great changes in the lakes. Among the phytoplankton, most of the diatoms and green algae species disappear below 5.8; and among the zooplankton, most of the daphnians disappear below 6.0. Low pH values will wipe out many fish species as well. Thus roach, minnow, arctic char and trout have disappeared from acidified waters. Their reproduction is affected below pH 5.5. Somewhat less sensitive fish, such as perch and pike, are also strongly influenced. The acidification can be followed further east and north in Sweden. If the acidification trend continues, thousands of the Swedish lakes will harbor a very strange aquatic life in the future.--Copyright 1974, Biological Abstracts, Inc.
W75-01473

NUTRIENT COMPETITION AND DIVISION SYNCHRONY IN PHYTOPLANKTON,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
R. W. Doyle, and R. V. Poore.
Journal of Experimental Marine Biology and Ecology, Vol 14, No 4, p 201-210, 1974. 3 fig, 1 tab, 19 ref.

Descriptors: *Growth rates, *Nutrients, *Phytoplankton, Dinoflagellates, Marine algae, Diurnal, Mathematical models, Competition.
Identifiers: *Division synchrony, Gulf Stream, *Sargasso Sea.

An ecological interpretation of the synchronous division of coexisting species of dinoflagellates in the nutrient-poor water of the Sargasso Sea is presented. Plankton collections were made in the Gulf Stream about 100 km east of Cape Lookout, North Carolina in late October of 1968. Samples were taken every hour for 24 hours. During this time the ship remained near the center of the Gulf Stream, reversing course whenever the temperature of the surface water fell 0.1C below its maximum value of 26C. Division of at least nine species of dinoflagellates occurred between 03.00 hr and 06.00 hr indicating a high level of developmental synchronization. Whereas light-dark and temperature cycles act independently on each species, the synchronizing agent in the Gulf Stream apparently couples the development of many species of the dinoflagellate community. Diurnal fluctuations in nutrients, acting through interspecific competition show that regular, short-term changes in nutrient levels are extremely effective in synchronizing the development of several species. The occurrence of competition ofr nutrients is suggested, and also that the degree of synchronization increases with the severity of nutrient limitation. A mathematical model of interspecific competition is given. (Jones-Wisconsin)
W75-01474

FRESHWATER ECOLOGY,
T. T. Macan.
Halsted Press, a division of John Wiley and Sons, Inc: New York, NY, 2nd ed, 343 p, 1974, $10.95.
Identifiers: *Denmark, *Ecology, *Freshwater animals, *Lakes, Oxygen, Production, Salinity, Water temperature, Calcium.

This book deals with the ecological factors which limit freshwater animals to specific locations, e.g., O2, salinity, Ca, water movement, desiccation and temperature. Physical and chemical properties of water movement on the substratum, mode of action of temperature, O2 concentration in natural waters, physiological problems confronting freshwater and marine species entering mixohaline water and effect of Ca concentration are discussed. Fauna of Esrom Lake, Hodson's Tarn, and Sore Grib Lake, which are located in Denmark, are examined and studied as examples of communities. Species transport, production, behavior and interrelationships are other ecological factors which affect species establishment. Methods for studying freshwater communities are also considered. Species are referred to by their scientific names throughout the text and additional synonymous names are listed separately at the conclusion of each chapter. Numerous graphs supplement the text and an extensive reference list is included.--Copyright 1974, Biological Abstracts, Inc.
W75-01475

REPORT OF THE WATER MANAGEMENT SECTOR GROUP ON EUTROPHICATION CONTROL.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
Report 03663, January 1974. 19 p.

Descriptors: *Water quality control, *Eutrophication, *Phosphorus, Detergents, Agriculture, Water pollution control, Sewage treatment, Nitrogen, Water pollution sources, Water pollution effects, Methodology, Governments, Water policy.
Identifiers: International considerations.

The Water Management Sector Group of the OECD presents a statement on man-made eutrophication of surface waters, the various problems it generates, the technical means available to control it, and the factors to be considered in the formulation of appropriate control policies. While the eutrophication problem is of national or regional concern, it is also sometimes international in scope. It can be controlled in many cases by techniques that are already available (which are outlined), with the key element as phosphorus control in the majority of cases. No one policy will necessarily suffice for any particular country, for any region within a country, or for any transboundary situation. The pervasiveness of eutrophication, the relative contributions from diffuse sources, the degree of installed capacity of treatment facilities, and the feasibility of detergent reformulation are all factors to be considered for making optimum decisions. In transboundary cases, coordinated policies are necessary between the concerned countries. The causes and sources of eutrophication are described as well as the effects of eutrophication. Several options to control eutrophication open to authorities are discussed--from reducing nutrient loads to legislative action. (Auen-Wisconsin)
W75-01476

STUDIES ON PLOVER COVE RESERVOIR, HONG KONG: COMPOSITION AND DISTRIBUTION OF THE PHYTOPLANKTON AND ITS RELATIONSHIP TO ENVIRONMENTAL FACTORS,
Hong Kong Univ. Dept. of Botany.
I. J. Hodgkiss.
Freshwater Biology, Vol 4, No 2, p 111-126, 1974. 10 fig, 3 tab, 10 ref.

Descriptors: *Phytoplankton, *Distribution patterns, *Eutrophication, *Reservoirs, Chemical analysis, Physical properties, Seasonal, Diurnal, Diatoms, Cyanophyta, Phosphorus, Nitrogen, Light penetration, Ammonia, Nitrates, Phosphates, Forecasting, Anabaena, Silica, Succession.
Identifiers: *Plover Cove Reservoir(Hong Kong), Microcystis aeruginosa, Anabaena flos-aquae.

Two algal blooms have occurred annually in Plover Cove Reservoir, Hong Kong, one during January-March and the other during July-September. These blooms are due almost entirely to the blue-green algae Microcystis aeruginosa and Anabaena flos-aquae. The survey was made to determine bloom composition, relationships between algal growth and environmental factors and presence of any daily, seasonal, and vertical distribution patterns. Phytoplankton counts and chemical/physical analyses were made for 2-1/2 years and a description of the variations in species composition and abundance is followed by analysis of the effects of the environmental factors on algal growth and their correlation with phytoplankton abundance. Seasonal, diurnal and vertical distribution patterns were analyzed by 24-hr surveys conducted for 1 year. Blue-green algal blooms were greatest in winter and in autumn; shoreline attached diatoms prevailed in winter. Blue-green algal blooms were attributed to a high rate of phosphorus and nitrogen supply, and occurrence of diatoms at such specific times to an increase in light penetration due to the phytoplankton paucity. Various well-marked distribution patterns were seen and the seasonal pattern of Microcystis aeruginosa was shown to be closely correlated with fluctuations in certain chemical parameters. (Jones-Wisconsin)
W75-01477

NAHUEL HUAPI: PLANKTON OF SOME LAKES IN AN ARGENTINE NATIONAL PARK WITH NOTES ON TERRESTRIAL VEGETATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
K. Thomasson.
Acta Phytogeographica Suecica, Vol 42, 1959. 83 p, 24 fig, 1 tab, 120 ref.

Descriptors: *South America, *Plankton, *Lakes, *Vegetation, Benthic fauna, Geology, Hydrography, Ponds, Streams, Benthos, Detritus, Diatoms, Littoral, Rivers, Fish, Waterfowl, Aquatic plants.
Identifiers: *Nahuel Huapi(Argentina).

The lakes in the southern half of the National Park of Nahuel Huapi, Argentina were studied. Samples of plankton and bottom fauna were collected and sporadic observations made on the terrestrial flora and fauna along the Swedish Limnological-South America Expedition routes. Six extensive nature sanctuaries, totally unaffected by human activity, are established for preservation of the rarer species of autochthonous fauna and flora. The climate, geology, flora and vegetation of the four zones (eastern, central, western, and alpine) are described and photographically illustrated. Hydrography of the six different lakes, besides tarns, ponds, temporary waters, and running waters are all included. Samples of benthos were collected from the littoral of Lake Guillelmo consisted mainly of detritus and small diatoms. Some plankters, common in the corresponding lake types of the northern hemisphere seem to be absent in South American samples. The phytoplank-

ters, as distributed in the lakes, with the dominants indicated, are listed. Species lists for phytoplankton communities show that all these lakes are oligotrophic. Many taxonomic notes and a great number of drawings of microscopical freshwater organisms are included. (Jones-Wisconsin)
W75-01478

ARAUCANIAN LAKES: PLANKTON STUDIES IN NORTH PATAGONIA, WITH NOTES ON TERRESTRIAL VEGETATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
K. Thomasson.
Acta Phytogeographica Suecica, Vol 47, 1963, 139 p. 48 fig, 11 tab, 274 ref.

Descriptors: *South America, *Lakes, *Plankton, *Systematics, Vegetation, Phytoplankton, Aquatic plants, Ponds.
Identifiers: *Araucanian Lakes(Chile), *Patagonia, Lake Nahuel Huapi.

The biogeography of Chile in the area containing the southern deciduous summer forests and the northern region of temperate forests, the Valdivian rain forest, is presented. The biocoenoses of the lakes are still little influenced by the activity of man. Naturalization of salmon has somewhat altered the original fish population. The main object of this study was the phytoplankton. Two main types of phytoplankton were discerned in the subtropical lakes in the Chilean district. A type characterized by abundant Dinobryon spp. is found in lakes poor in available dissolved nutritive material. These lakes are small with small drainage areas. The second type of plankton is characterized by rich growth of Melosira granulata and occurs in lakes with more nutrients. In Lake Nahuel Huapi, during the warm and dry season, plankton is characterized by a rich development of Dinobryon, Rhizosolenia, and Melosira. During the cold and rainy season, Dictyosphaerium colonies make up a considerable part of the plankton. Occurrence of Fragilaria crotonensis is one of the surprises from the lakes along the eastern slopes of the Andes. Another noteworthy point is the occurrence of the genus Ceratium in North Patagonia lakes. Taxonomic comments and illustrations of various microphyta and microzoa species are included. (Jones-Wisconsin)
W75-01479

LAKE KINNERET SEDIMENTS: NUTRIENT COMPOSITION OF THE PORE WATER AND MUD WATER EXCHANGES,
Kinneret Limnology Lab., Tiberias (Israel).
C. Serruya, M. Edelstein, U. Pollingher, and S. Serruya.
Limnology and Oceanography, Vol 19, No 3, p 489-508, 1974. 5 fig, 13 tab, 35 ref.

Descriptors: *Sediments, *Cycling nutrients, *Pore water, *Mud-water interfaces, Organic matter, Bottom sediments, Currents(Water), Water temperature, Benthic flora, Iron, Phosphorus, Sulfates, Sulfides, Calcium, Phosphates, Sinks, Ammonia, Ammonification, Eutrophication, Detritus, Turnovers, Bacteria, Algae, Manganese, Nitrogen, Oxidation reduction potential.
Identifiers: *Lake Kinneret(Israel), Peridinium, Trypton.

Fluctuations of nutrient concentration in pore water of Lake Kineret sediments as a function of the bottom conditions, currents, temperature, flora, and of sedimentation rate and composition of trypton at different stations are shown. Composition of pore water of sediments of four stations at different depths was measured for 20 months. Dissolved iron reaches its maximum solubility at the beginning of turnover. Exchangeable phosphorus seems to be the iron-bound fraction and its concentration in pore water increases simultaneously with reduction of sulfates and precipitation of iron sulfide, but its release is controlled by the calcium phosphate equilibria. The mechanism explains how the phosphorus release rate is only 0.8 mg/sq m/day and how the Kinneret sediments play the role of a sink for phosphorus. Ammonia is produced by an intense process of ammonification and its rate of release reaches 25 mg/sq m/day. The internal nutrient load is compared to the external load. Since there is evidence that winter-spring Peridinium bloom can be supported solely by internal load, working hypotheses are provided concerning relationship between release of nutrients from mud and nature of the bloom. (Jones-Wisconsin)
W75-01480

MECHANICAL AND HABITAT MANIPULATION FOR AQUATIC PLANT MANAGEMENT,
Wisconsin Dept. of Natural Resources, Madison.
S. A. Nichols.
Technical Bulletin No 77, 1974. 36 p, 13 fig, 3 tab, 67 ref.

Descriptors: *Aquatic weed control, *Habitats, *Technology, Biology, Equipment, Harvesting, Disposal, Dredging, Sands, Light penetration, Nutrients, Plant morphology, Costs, Water level fluctuations.
Identifiers: Shading, Sand blanketing.

The requisite biology and planning procedures necessary for an aquatic plant management program are presented. Mechanical control deals with harvesting and removal, for which there is a wide range of equipment available. Cutting may be more difficult but pickup possibly easier than with conventional agricultural crops. Literature reviews indicate that intensive mechanical removal programs can significantly reduce plant biomass not only during the harvesting year but possibly in subsequent years. The high initial investment in machinery is probably the most serious obstacle to implementing a harvesting program. Harvesting has beneficial ecological implications and its cost and effectiveness have the same magnitude and variability in results as does herbicide treatment. Review of habitat manipulation includes such considerations as light limitation, including shading with dyes and black plastic sheeting, water level manipulation, sand and gravel blanketing, nutrient limitation, and dredging. Species identification, growth patterns, and plant distribution are prerequisites for any management program. Some management techniques are more suitable for one plant species than another or are more easily used in certain types of areas. Aquatic plant anatomy is particularly relevant to harvesting. The efficacy of various techniques is summarized. (Jones-Wisconsin)
W75-01481

ANNUAL AND SEASONAL VARIATIONS OF PHYTOPLANKTON, CHLOROPHYLL, AND PHOTOSYNTHESIS IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberian (Israel).
T. Berman, and U. Pollingher.
Limnology and Oceanography, Vol 19, No 1, p 31-54, 1974. 13 fig, 7 tab, 62 ref.

Descriptors: *Lakes, *Fluctuations, *Phytoplankton, *Chlorophyll, *Photosynthesis, Dinoflagellates, Subtropic, Biomass, Eutrophication, Productivity, Standing crops, Chlorophyta, Annual, Seasonal.
Identifiers: *Lake Kinneret(Israel), Peridinium cinctum.

Data reported here for Lake Kinneret, Israel probably represent the most prolonged and detailed observations to date on phytoplankton biomass and productivity in a warm lake of this size and depth. Annually, during January to June, a heavy bloom of the dinoflagellate Peridinium cinctum fa westii occurs. Determination of the biomass standing stock was based on the volume of each species and primary production measurements, chlorophyll concentrations (estimated by the spectrophotometric method), and measurements of radioactive soluble organic compounds released from the algae during incubation. Rates of carbon assimilation were not exceptionally high, but algal biomass and chlorophyll concentrations during the bloom season were among the highest recorded for the trophogenic zone of any natural water body. Effective utilization of environmental conditions by the motile Peridinium dominating the phytoplankton assemblage may partly explain the large standing crops. During the bloom, physiological activities are minimal; conversely, high value for these parameters occurs in late summer and fall and at the bloom start. To some extent, Lake Kinneret may serve as a model for such systems and particularly for the study of their reaction to the pressures of cultural eutrophication. (Jones-Wisconsin)
W75-01482

WIND-BLOWN DUST AS A SOURCE OF NUTRIENTS FOR AQUATIC PLANTS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W75-01483

EFFECTS OF WASTE DUMPING IN NEW YORK BIGHT ON THE GROWTH OF NATURAL POPULATIONS OF PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
D. L. K. Young, and R. T. Barber.
Environmental Pollution, Vol 5, No 3, p 237-252, 1973. 7 fig, 4 tab, 28 ref. NSF GA 28742, GA29303.

Descriptors: *Effects, *Waste dumps, *Bays, *Phytoplankton, New York, Solid wastes, Organic matter, Heavy metals, Dredging, Sewage sludge, Inhibition, Industrial wastes, Productivity, Toxicity.
Identifiers: New York Bight.

A laboratory study was undertaken to examine the growth of natural phytoplankton populations in relation to possible effects from organic material or heavy metal content associated with dredge-spoil and sewage sludge dumping sites in the New York Bight. In spite of high amounts of potentially-toxic organic matter and heavy metals in New York Bight waters, reported to be concentrated in sediments at the disposal sites, inhibition of phytoplankton growth was not consistently demonstrated throughout the study at any particular disposal site. From the data presented, it is clear that neither the location of a sampling site within a dumping area nor even gross seasonal hydrographic differences can be used reliably to predict phytoplankton productivity. In New York Bight waters from outside those areas highly affected by sewage sludge or dredge-spoil dumping, the growth of natural phytoplankton populations was initially exponential. Waters sampled from the disposal areas were temporally and spatially inconsistent in supporting initial rapid growth. Inhibition occurred only as a temporary lag. The dominant phytoplankter that grew exponentially was, with a single exception, a typical coastal bloom species. The temporary inhibition was more probably due to toxic organic materials that to heavy metals. (Jones-Wisconsin)
W75-01484

ALGAE CONCOMITANT WITH SPONGILLA (SPONGILLA) LACUSTRIS (L.) VEJD. IN THE KRUTYNIA RIVER,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Instytut Inzynierii i Biotechnologii Zywnosci.
H. Chudyba.
Ekologia Polska, Vol 21, No 6, p 89-103, 1973. 1 fig, 4 tab, 26 ref.

Descriptors: *Algae, *Systematics, Symbiosis, Plankton, Parasitism, Diatoms, Chlorophyta, Cyanophyta.

Identifiers: *Spongicolous algae, *Spongilla lacustris, Krutynia River(Poland).

Species composition of Spongilla lacustris spongicolous algae in the Krutynia River, Poland was studied and compared with plankton and benthic algae. The algae investigated were those found on the sponge surface or inside. So-called zoochlorella, bacteria and fungi were not considered. Algae inhabiting sponges did not differ at various depths and species composition and numbers indicate that the sponge is an unsuitable substratum for algae. A total of 128 algal species of 51 genera were determined from the surface of S. lacustris body, only 88 being on the surface. Remaining 40 species were found inside the organisms which included diatoms (96 species, varieties and forms from 26 genera), green algae (17 species from 12 genera), and blue-greens (8 species from 8 genera). Other systematic groups were not numerous. Among the determined species only Achnanthes hauckiana, A. kolbei and Fragilaria inflata were uncommon. Frequency of algal occurrence inside the S. lacustris organisms was low and algal vitality poor, consisting mainly of dead cells. Apparently the sponge can digest an alga which has entered its body. No species was especially associated with sponges. (Jones-Wisconsin)
W75-01485

THE EFFECT OF AN INFLUX OF NEW SPECIES ON THE DIVERSITY OF PROTOZOAN COMMUNITIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., and W. H. Yongue, Jr.
Rivista de Biologia, Vol 9, No 1-4, p 187-206, 1073. 1 fig, 4 tab, 3 ref.

Descriptors: *Invasion, *Protozoa, *Biological communities, Competition, Laboratory tests.

Effects of a continuous influx of new species on maintenance of diversity was studied using water from Copper Creek, Colorado with an inoculum containing mud and water from a local marsh. Another, similar experiment used Douglas Lake, Michigan water. Third experiment studied effects of the presence of a reservoir of encysted species on population dynamics of a protozoan association. Data from the first suggest that periodic influx resulted in considerably higher species diversity than in systems to which no species were added. In the second experiment, periodic influx of species did not markedly affect the number of species present. This may be due to the fact that in the first experiment water from Copper Creek was used, a stream low in protoxoan species and nutrients, while in the second water from Douglas Lake, comparatively righ in protozoan species and nutrients was used. The latter may have had all the species the system could accomodate while the former had unoccupied niches. It is concluded that: invasion pressure does not increase species number beyond a certain point, and even in the absence of competition, only about half of the invading species were successful. (Jones-Wisconsin)
W75-01486

PRODUCTION OF BACTERIAL BIOMASS IN THE WATER OF THE ILAWA LAKES,
Akademia Rolniczo-Techiczna, Olsztyn, Kortowo (Poland). Instytut Inzynierii i Biotechnologii Zywnosci.
S. Niewolak.
Acta Hydrobiologica, Vol 16, No 1, p 101-112, 1974. 1 fig, 4 tab, 31 ref.

Descriptors: *Productivity, *Bacteria, Biomass, Reproduction, Organic wastes, Eutrophication, Water temperature.
Identifiers: *Ilawa Lakes(Poland), Bacterioplankton.

The results of investigations on the intensity of reproduction and production of bacterial biomass (bacterioplankton) in the annual cycle in the sewage Lake Jeziorak Maly and in the eutrophic Lake Jeziorak in the Polish Mazurian Lake District are reported. The generation time of aquatic bacteria was determined using the method given by Rasumov and described by Ivanov as it allows the bacterial generation time to be determined under the natural conditions of water bodies. The total number of the bacterioplankton in samples was determined by the direct counting method on membrane filters. The bacterioplankton reproduces more intensely in Lake Jeziorak Maly (generation time 3.5-27.8 hrs) and less intensely in Lake Jeziorak (Generation time 1.7-204.2 hrs). The bacterioplankton biomass ranged from 9.03 to 63.52 mg C/cu m in Lake Jeziorak Maly and from 1.42-83.31 mg C/cu m in Lake Jeziorak. With regard to the amount of daily produced organic matter in the form of bacterioplankton cells, the investigated Ilawa Lakes do not basically differ from a number lakes and eutrophic water bodies in different climatic zones. (Jones-Wisconsin)
W75-01488

THE CHANGES OF WINTER PHYTOPLANKTON IN RELATION TO THE LIGHT CLIMATE IN THE LAKES WITH VARIOUS TROPHY,
Instytut Przyrodniczych Podstaw, Lublin (Poland). Produkeji Roslinnej AR.
W. Lecewicz, W. Sokolowska, and I. Wojciechowski.
Ekologia Polska, Vol 21, No 13, p 193-208, 1973. 4 fig, 3 tab, 15 ref.

Descriptors: *Winter, *Phytoplankton, *Light intensity, Lakes, Trophic level, Ice cover, Snow cover, Distribution, Photosynthesis.
Identifiers: Lublin District Lakes(Poland).

Bikcze, Brzeziczno and Piaseczno Lakes in the Lublin District, Poland were studied to evaluate the changes of light transmission as it affects the changes in numbers and biomass of phytoplankton. Although the distance among these lakes is smaller than 2.5 km, they differ considerably in limnological type. Lake Bikcze is shallow, polymictic, surrounded by reed beds, fields and meadows; Lake Brzeziczno is in the middle of a peat bog; and Lake Piaseczno is the deepest with sandy shores. A positive relation of the phytoplankton development to the light transmission through the ice and snow cover was found in all three lakes. The lack of snow on ice caused a distinct growth of phytoplankton during the first half of winter, and their vertical distribution was similar to the lakes' summer stratification. A rapid decrease of phytoplankton numbers and biomass occurred after the snow fall at the end of February. The phenomena observed in Lakes Bikcze and Brzeziczno shows that the increase of phytoplankton quantity in winter even under the influence of great quantities of light is definitely slower than the decrease of phytoplankton when light penetration is restricted. (Jones-Wisconsin)
W75-01489

PRIMARY PRODUCTIVITY OF ROOTED MACROPHYTES IN THE LITTORAL ZONE OF LAKE GEORGE,
Rensselaer Polytechnic Inst. Troy, N.Y. Dept. of Biology.
C. W. Boylen.
Eastern Deciduous Forest Biome IBP Memo Report 73-13, July 1973. (FWI Report 73-6). 11 p, 12 ref. NSF AG-199, AEC 40-193-69.

Descriptors: *Primary productivity, *Rooted aquatic plants, *Littoral, *New York, Mathematical models, Bottom sediments, Distribution, Plant growth.
Identifiers: *Lake George(NY), Potamogeton robbinsii.

This study was conducted to provide a basis for assessing the role of rooted macrophytes in the total primary productivity of Lake George and for continued research on the role of these plants in the future development of Lake George. The following were considered: what is the present annual productivity of these plants and can this productivity be mathematically written to yield an accurate productivity prediction; what is the relation of the various species which grow in the littoral zone to each other, to bottom type, water depth, and to water and sediment chemistry of the littoral zone; what are the nutritional interactions of the epiphytic algae and bacteria on the rooted macrophytes. Preliminary results are given. Two bays were chosen to typify macrophyte growth, one heavily developed and one little affected by human development. Growth patterns of the macrophytes are characterized. Potamogeton robbinsii was chosen for studying the biochemical measurements for the macrophyte model. Water column samples and sediment samples for interstitial water are being collected biweekly. Nutrient concentrations in the bottom water provide data for the model, but will also provide new data for the littoral sediments. (Jones-Wisconsin)
W75-01490

NUTRIENT INPUTS TO A LAKE AND THEIR EFFECTS UPON WATER QUALITY,
Rennselaer Polytechnic Inst., Troy, N.Y. Bio-Environmental Engineering Div.
D. B. Aulenbach, and N. L. Clesceri.
Eastern Deciduous Forest Biome IBP Memo Report 73-14, 1973. (FWI Report 73-8). 33 p, 3 fig, 2 tab, 12 ref. NSF AG-199, AEC 40-193-69.

Descriptors: *Nutrients, *Lakes, *Water quality, Bodies of water, Lake morphology, Watersheds(Basins), Primary productivity, Secondary productivity, Decomposing organic matter, Water properties, Precipitation(Atmospheric), Runoff, Groundwater, Human population, Nitrogen, Phosphorus, Bottom sediments, Water quality standards.
Identifiers: *Lake George(NY).

Determining the inputs of nutrients to a lake is the first step in understanding biological growth. Fate of the nutrients must also be known to maintain a complete balance within any lake system. Quality of the water to prevent excessive algal growth must be superior to that required for human drinking water consumption. Orthophosphate appears to fluctuate for a 48-hour cycle by a factor of approximately 10 making evaluation of the phosphorus content difficult to establish. It may also help to explain some discrepancies which have existed in establishing a limiting phosphorus level for production of excess biological growth. Evaluation of nutrients and their effects upon water quality requires sampling at various locations and at different depths for at least one year. At least one extended period of sampling should be conducted for a minimum of 60 hrs, at 4 or 6 hour intervals, to determine any cycles of nutrients during this period. With sufficient information, a correlation can be established between nutrient content and biological productivity. Knowing the sources of nutrient inputs means of control can be established to maintain water quality satisfactory for all uses. (Jones-Wisconsin)
W75-01491

SEAWEED INVASION,
R. Wassman, and J. Ramus.
Natural History, Vol 82, No 10, p 25-26, 28-29, 32, 34, 36, 1973. 1 fig.

Descriptors: *Sea water, *Aquatic weeds, *Invasion, Marine algae, Shellfish, Northeast US, Reproduction, Life history studies, Eutrophication, Aquatic weed control.
Identifiers: Codium fragile, Seaweeds.

A large green seaweed formerly found in almost all temperate waters of the world except along northeastern shores of the United States has now come to that region. In its new habitat, the alien species grows at an astonishingly rapid rate, disrupting the environment by driving out native seaweeds and blanketing and destroying prime shellfish beds. Although Codium fragile normally reproduces by means of its swimming cells, the plant, like other seaweeds, can also reproduce through fragmentation of existing thalli. Since the bodies of water that Codium has infested in the northeast are nearly eutrophic due to the high population density around them, it is feared that its rapid growth rate might be attributable in part to the enrichment of the water by waste phosphates and nitrates. The proper enrichment studies have not yet been made. A large plant is often more than a shellfish can endure, and deleterious effects may result in several ways. The scallop is harmed by being unable to snap together its two fluted valves due to growth of a Codium plant on one valve. For control, it might be developed as silage, fodder, or a soil conditioner. (Jones-Wisconsin)
W75-01492

CONTENT OF INDOLE AND OF ALIPHATIC AMINES IN GREEN FRESHWATER UNICELLULAR ALGAE FROM THE SCENEDESMUS GENUS,
Bulgarian Academy of Sciences, Sofia. Inst. of Industrial Microbiology.
K. Velev.
Proceedings of the Bulgarian Academy of Sciences, Vol 26, No 12, p 1677-1679, 1973. 1 fig, 9 ref.

Descriptors: *Aromatic compounds, *Algae, *Scenedesmus, *Biochemistry, Methodology, Chromatography.
Identifiers: *Indole, Aliphatic amines, Scenedesmus acutus.

The content of aliphatic and aromatic nitrogen bases was investigated in Scendesmus acutus, strain 8, Tomasselli. The nitrogen-containing compounds in the medium were eluted with benzene and with a mixture of ethyl ether-acetone from a column with neutral aluminium oxide. The two fractions obtained were studied separately. The first compound consists of colorless crystals with specific smell, soluble in petroleum ether, acetone and ethanol. Ultraviolet measurements show its aromatic character. Detailed analysis showed the presence of indole. The second fraction was a pale-yellow liquid with an unpleasant smell predominantly of an animal tinge. From this fraction, two compounds were separated manifesting brown-red spots. Absence of measurable absorption in the near ultraviolet range and data from the analysis of the corresponding infrared spectrum have indicated that the fraction constitutes a mixture of lower and volatile secondary aliphatic amines whose content, in the material obtained from Scenedesmus acutus, is very low. The indole is probably a normal product of the metabolic processes. The presence of biogenic aliphatic amines, identified for the first time in Scenedesmus acutus, is of interest in connection with the possibilities of obtaining spermidine, on an industrial basis from various algal strains. (Jones-Wisconsin)
W75-01494

A NATIONAL POLICY FOR PHOSPHATE CONTROL IN THE ENVIRONMENT,
Texas A and M Univ., College Station. Environmental Chemistry.
G. Lee.
Bulletin No 1, October 1973. 19 p.

Descriptors: *Phosphates, *Control, *Detergents, Nutrient removal, Domestic wastes, Industrial wastes, Institutional constraints, Waste water treatment, Administration, Water pollution control, Formulation.
Identifiers: *National policy.

Indiscriminate phosphorus removal from wastewaters and detergent formulations is unwarranted on the cost-benefit basis as phosphorus is not the universal limiting nutrient in eutrophication. It is suggested that it be determined in each major watershed whether there are potential or real problems of excessive fertilization, and whether phosphate is limiting aquatic plant growth in that region. If excessive amounts of phosphate are present so that aquatic plant growth is limited by other elements of physical conditions, then it should be ascertained whether there is any possibility of limiting phosphorus input to the watershed to the point where it can be made limiting, a relatively simple task as a result of modern chemical and bioassay techniques. The only place where phosphate removal from detergent formulations is justified is where it can be shown that large amounts of wastewaters enter surface waters with little or no treatment or where treatment facilities are inadequate to handle phosphate removal. The regional legal approach to banning phosphate-detergents contains potential problems as manifested in certain areas. Detergent formulations substituting compounds other than phosphorus should meet the criteria of environmental and consumer acceptability. An appendix discusses the technical deficiences of the 1973 Sweeney report on Erie Conty, New York. (Auen-Wisconsin)
W75-01495

PHOSPHORUS MODEL OF LAKE EUTROPHICATION,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
D. M. Imboden.
Limnology and Oceanography, Vol 19, No 2, p 297-304, 1974. 2 fig, 2 tab, 14 ref.

Descriptors: *Phosphorus, *Mathematical models, *Eutrophication, Epilimnion, Hypolimnion, Oxygen, Depth, Limiting factors, Nutrients, Sediments, Lakes.

A two-box lake model is described with the subsystems epilimnion and hypolimnion and phosphorus as the limiting nutrient factor. The mean oxygen consumption in the hypolimnion as a function of P loading is calculated and critical P-loading figures above which the lake turns toward eutrophy are given for varying lake mean depths and hydraulic loading factors. Results agree with an empirical relation between lake mean depth and P loading as given by Vollenweider. Also, P retention factors are calculated using the model and compared to measured values. The following qualitative conclusions concerning the memory and the rate of a lake's response to changes in nutrient input are drawn: a lake, oscillating between two annual states, each described by a different set of model parameters, reaches the corresponding steady states faster if its mean depth is small and its hydraulic loading factor is large. A deep lake may have a memory in its hypolimnion consisting of both slow approach to steady state and incomplete renewal of its oxygen reserves. Its persistence against increase of nutrient input may keep the lake oligotrophic for a time. Both shallow and deep lakes may also have an important and long lasting memory in the sediments. (Jones-Wisconsin)
W75-01496

OXYGEN UPTAKE, AMMONIA AND PHOSPHATE EXCRETION BY ZOOPLANKTON OF A SHALLOW EQUATORIAL LAKE (LAKE GEORGE, UGANDA),
Freshwater Biological Association, Ambleside (England); and Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
G. G. Ganf, and P. Blazka.
Limnology and Oceanography, Vol 19, No 2, p 313-325, 1974. 7 fig, 4 tab, 37 ref.

Descriptors: *Cycling nutrients, *Balance of nature, *Zooplankton, Oxygen, Ammonia, Phosphates, Carbon, Tropical regions, Absorption, Respiration, Herbivores, Water temperature, Diurnal, Nitrogen, Phosphorus, Grazing.
Identifiers: *Nutrient regeneration, Excretion, Lake George(Uganda), Thermocyclops hyalinus.

An estimate for the rate of nitrogen, phosphorus, and carbon supply to the shallow, tropical, freshwater Lake George, Uganda via zooplankton excretion and respiration is provided. Only those nitrogen and phosphorus fractions readily available to algae were measured. The magnitudes of the diurnal changes of pH, total carbon dioxide, oxygen concentration, light intensity, and temperature in the lake are similar to those normally encountered by temperate aquatic populations during the course of a year. The zooplankton community of the lake is dominated by the very small, herbivorous, raptorial cyclopiod, Thermocyclops hyalinus, which constitutes about 70% of the total crustacean zooplankton biomass. The measured excretion-respiration rates at 27.3C were high but support the hypothesis that they increase with decreasing body size. Rates were temperature dependent and showed a diurnal variation that may be associated with a diurnal feeding pattern. The ratios between the annual zooplankton excretion and the total annual input of nitrogen and phosphorus to the lake were calculated to be 1.1 and 2.7 for nitrogen and phosphorus, respectively. (Jones-Wisconsin)
W75-01497

THE EQUILIBRIUM AND STABILITY OF SIMPLE MARINE BIOLOGICAL SYSTEMS. II. HERBIVORES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
O. M. Phillips.
Archiv fur Hydrobiologie, Vol 73, No 3, p 310-333, 1974. 6 fig, 12 ref.

Descriptors: *Marine biology, *Equilibrium, *Stability, *Balance of nature, *Mathematical models, Biological communities, Nutrients, Herbivores, Density, Reproduction, Population, Light intensity, Growth rates, Competition, Food chains.
Identifiers: Species diversity.

In a homogeneous aquatic biological system in which different species of primary consumers compete for the available nutrients and various species of herbivore crop some or possibly all of the species to primary nutrient users, it is shown that the principle of competitive exclusion holds only for species not subject to cropping or predation. In a saturated ecological system, it follows that the primary consumers not being cropped serve as a buffer to the system against variations in nutrient supply. When light intensity limits the growth of primary nutrient users, the equilibrium number of the primary consumers is determined by the growth rate characteristics of the herbivore population, and the equilibrium number density of the herbivores is found to be determined by the rate at which the primary consumer population tends to increase and by the rate of cropping of each herbivore. The stability of a linear chain is considered in which there is one limiting nutrient, one species of primary consumer and one herbivore species. The condition for equilibrium is simple when adequate nutrients are available, but it is apparently not satisfied by Daphnia magna eating Chlorella vulgaris for which adequate nutrients are available. (See also W74-01822) (Jones-Wisconsin)
W75-01498

THE CARBON BUDGET CONCEPT: A QUANTATIVE MEASURE OF TROPHIC STATE,
Massachusetts Univ., Amherst. Dept. of Chemistry.
O. T. Zajicek.

Water Research, Vol 8, No 8, p 517-523, 1974. 7 fig, 3 tab, 7 ref.

Descriptors: *Measurement, *Carbon, *Trophic level, Mathematical studies, Carbon dioxide, Productivity, Alkalinity, Water temperature, Hydrogen ion concentration, Ammonia, Nitrogen.
Identifiers: *Carbon budget.

A concept is proposed which holds the possibility of being a quantitative measure of the trophic state of a lake. It is important to develop, if possible, an easily obtained trophic index which incorporates as many important variables as possible. The new concept and quantity presented here is called the Carbon Budget, which meets the requirements of being easily measured and calculated, is quantitative, and incorporates important parameters. The parameters needed to be measured are carbon dioxide, alkalinity (both bicarbonate and carbonate), temperature, and pH. The calculation is presented. The Carbon Budget is a direct measure of the imbalance between the ambient distribution of inorganic carbon species and the equilibrium distribution for the system, and an indirect measure of the relative competition of carbon dioxide production and consumption processes occurring in the water. The Carbon Budget has been correlated with ammonia nitrogen to provide a link with protein synthesis and degradation, and applied to two areas of a large oligotrophic lake. It is possible to distinguish between the two areas both qualitatively and quantitatively by applying the Carbon Budget concept. (Jones-Wisconsin)
W75-01499

ABSORPTION FROM THE AMBIENT WATER AND COMBUSTION OF ETHANOL IN YOUNG ATLANTIC SALMON (SALMO SALAR L.) AT DIFFERENT TEMPERATURES,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
B. Hoglund, L. Pilstrom, and M. Sjoblom.
Acta Physiol Scand. Vol 90, No 1, p 73-78, 1974. Illus.
Identifiers: *Absorption, Ambient water, *Atlantic salmon, *Ethanol combustion, Salmosalar, Salmon, Wastes, Water temperature, Fish behavior, Bioassay.

After 5-10 h exposure in static bio-assays 1st-summer S. salar live in equilibrium with the ambient ethanol concentration of 117 mmol/l at 10 and 16 C. At 4C this equilibration is retarded and is not evident until after 24 h. A quantitative connection between ethanol oxidation (M) and body weight (W) in accordance with the general formula M equal to KxWb seems to exist for young salmon at 16C. From the present tests the numerical values of the constants K and b were estimated to be approximately 10.5 and -1.03 respectively. Changes in behavior induced by ethanol and the influence of temperature upon the metabolism of ethanol are discussed briefly. Ethanol is commonly used as a solvent, e.g., in fish toxicological and/or fish physiological experiments. Considerable amounts of ethanol may appear in waste water discharged from the manufacturers of organic chemical compounds and pharmaceuticals.--Copyright (c) 1974, Biological Abstracts, Inc.
W75-01501

NITROGEN: A PROBLEM OF DECREASING DILUTION,
Imperial College of Science and Technology, London (England). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W75-01502

SEASONAL CHANGES OF BIOMASS OF BENTHIC ALGAE IN THE LITTORAL OF MIKOLAJSKIE LAKE,
Warsaw Univ. (Poland). Dept. of Hydrobiology; and Warsaw Univ. (Poland). Zoological Inst.
A. Kowalczewski, K. Prejs, and I. Spodniewska.
Ekologia Polska, Vol 21, No 14, p 209-217, 1973. 1 fig, 2 tab, 17 ref.

Descriptors: *Seasonal, *Biomass, *Littoral, Benthic flora, Algae, Lakes, Chlorophyll, Eutrophication, Diatoms, Pigments.
Identifiers: *Mikolajskie Lake(Poland), Phaeophytin, Dead algae.

Estimate was made of the seasonal biomass changes of benthic algae on four sites in the littoral of Mikolajskie Lake, Poland, a eutrophic, holomictic lake, and the contribution of live algae and chlorophyll content. Diatoms visibly dominated and averaged about 35% of the algal biomass. Comparison of the average phytobenthos biomass, chlorophyll concentration and the percentage of phaeophytin and dead algae in bottom sediments is tabulated. The planktonic forms were exceptionally abundant in May at one site and Oscillatoria sp. in autumn at two other sites. The phytobenthos development differed in biomass between specific sites with similar seasonal tendencies. Bottom algae biomass was greatest in August on site 4; the summer biomass of algae was small with a slight maxima in autumn. The contribution of phaeophytin to the total amount of pigments can be treated as an index of the contribution of dead algae in the examined community. The differences in the percentage of dead algae obtained by two methods are relatively small and it can be assumed that the average number of dead cells in the total number of algae in the littoral is about 25% (20% in the spectrophotometric method, and 30% in the luminescence method). (Jones-Wisconsin)
W75-01504

CONTINUOUS AUTOMATED MEASUREMENT OF RATES OF PHOTOSYNTHESIS AND RESPIRATION IN AN UNDISTURBED RIVER COMMUNITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W75-01505

A PROGNOSIS FOR A LAKE,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen, O. S. Jacobsen, and I. Hoi.
Vatten, Vol 4, p 382-404, 1973. 18 fig, 7 tab, 30 ref.

Descriptors: *Water pollution control, *Lakes, *Forecasting, Physicochemical properties, Biological communities, Nutrient removal, Phytoplankton, Benthic fauna, Productivity, Limiting factors, Lake sediments, Phosphorus, Nitrogen, Sedimentation, Equations, Sediment-water interfaces.
Identifiers: *Lake restoration, Lake Glumso(Denmark).

A physical-chemical and biological investigation of Lake Glumso, Denmark was made to determine the present biological and chemical situation of the lake; which limiting factor is most easy to control; how quickly will the condition of the lake be improved if the waste water treatment method described should be applied. The lake is classified as a pond because of its shallow depth. Composition of phytoplankton and zooplankton are given. Generally the bottom fauna is characterized by a low number of species and individuals. All animals are characteristically tolerant to organic pollution and include leeches, oligochaetes, insects, and snails. The annual cycles of the chemical parameters of the lake are illustrated. For lake recovery, phosphorus must be considered as the limiting factor, but how fast will the lake recover, taking into account the pool of phosphate present in the sediment is problematical. On the basis of the mass balances, it must be concluded that the lake is saturated with phosphate and that denitrification takes place. It is not possible to control nitrogen as a limiting factor. On the basis of equations a prognosis can be set up if the phosphorus concentration in the effluent from the waste water treatment plant is reduced to 0.1 mg/l P. (Jones-Wisconsin)
W75-01506

STUDIES OF SIZE SELECTIVE FEEDING BY ZOOPLANKTON DESIGNED FOR IMPLEMENTATION OF PROCESS MODELLING,
State Univ. of New York, Albany. Dept. of Biological Sciences.
D. C. McNaught, and K. Bogdan.
Eastern Deciduous Forest Biome IBP Memo Report 73-66, 1973. 4 fig, 9 tab, 5 ref. NSF AG-199, AEC 40-193-69.

Descriptors: *Feeding rates, *Zooplankton, *Model studies, *Grazing, *New York, Size, Herbivores, Phytoplankton, Nannoplankton, Bacteria, Detritus, Daphnia.
Identifiers: Lake George(NY), Diaptomus, Diaphanosoma.

An understanding of zooplankton grazing is essential to both the interpretation of secondary processes and the modeling of aquatic ecosystems. Comparing the filtering abilities of the zooplankton on algae and detritus of different sizes may provide insight into the competitive abilities of these herbivores as well as help predict the effects that artificial perturbations may have on both individual species and aquatic ecosystems undergoing eutrophication. The experimental program consisted of measuring the filtering rates of the dominant zooplankters on foods found in Lake George, New York. These foods were categorized for manipulation as net phytoplankton (greater than 22 microns), nanophytoplankton (less than 22 microns), free floating bacteria, total phytoplankton, artificial detritus, and concentrations of 2X net phytoplankton. The zooplankton filtering rates were measured on one tagged food resource in the presence of the other two. Experiments were limited to 10 min. to eliminate the problem of excretion of radioactive matter. On phytoplankton food, both Diaphanosoma and Diaptomus were shown to select small phytoplankters (Nanoplankton), while Daphnia showed no preference. Both Daphnia and Diaphanosoma preferred bacteria over algae. These data will be valuable in calibration of zooplankton biomass and resource allocation models. (Jones-Wisconsin)
W75-01507

PRIMARY PRODUCTION AND LIMITING NUTRIENTS IN A SMALL, SUBALPINE WYOMING LAKE,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
J. F. Wagner, and M. Parker.
Transactions of the American Fisheries Society, Vol 102, No 4, p 608-706, 1973. 7 fig, 3 tab, 32 ref.

Descriptors: *Primary productivity, *Nutrients, *Lakes, *Fisheries, *Wyoming, Water temperature, Summer, Limiting factors, Fertilization.
Identifiers: *Little Brooklyn Lake(Wyo), Subalpine lakes, Limiting nutrients.

To determine the possibility of fish production, the primary productivity of a Snowy Range lake was measured and the factors that limit primary production determined. Little Brooklyn Lake, a small, shallow, subalpine lake, was chosen because of easy accessibility and relatively little recreational pressure. Productivity experiments indicated that there was no relationship between productivity at any depth and light intensity at that depth. Samples taken near the bottom always had higher productivity than samples taken near the surface, probably due to more optimal nutrient conditions. Nutrient enrichment experiments support this hypothesis, since sediment extract and EDTA were always effective in enhancing productivity. The effects of other nutrients and nutrient combinations were less consistent, and tended to change through the summer. A large number of significant three, four and five factor interactions in midsummer indicated that the nutrient requirements of the algal community were most complex at this time. Although retention time increased through the summer from 10 to 71 hours, productivity tended to more closely parallel water tem-

perature. Significantly lower productivity in the faster flushing portion of the lake suggests that algal populations in this area were unable to accumulate before being flushed downstream. (Jones-Wisconsin)
W75-01508

NUMERICAL ABUNDANCE OF DOMINANT COPEPODS FROM THE NORTHEAST PACIFIC OCEAN: COLUMBIA RIVER EFFLUENT AREA, 1963,
Washington Univ., Seattle. Dept. of Oceanography.
M. Jawed.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-773 933, $5.25 in paper copy, $2.25 in microfiche. Technical Report No. 286, June 1973. 108 p, 9 fig, 2 tab, 14 ref. ONR N00014-67-A-0103-0014 AT(45-1)-2225.

Descriptors: *Coasts, *Dominant organisms, *Copepods, *Distribution, *Pacific Ocean, Columbia River, Effluents, Washington, Oregon, Zooplankton, Water pollution effects.

Results are given of analyses of the species composition of copepods off the coasts of Washington and Oregon. It is based on the examination of 349 zooplankton samples obtained from March to December 1963, with special reference to the Columbia River plume. One long-term objective was to establish the community structure and to study the seasonal and spatial distribution patterns of biological populations in this area. Zooplankton samples were obtained using Clarke-Bumpus samplers as modified by Paquette and Frolander. The sampling depths were at the surface, 35 m, 70 m and 100 m. Most samples were obtained in offshore regions, at about midnight. In the laboratory, the samples were divided into two halves using a Folsom plankton splitter. One half was used to determine species composition; the other used in the determination of dry weight. All stations were classified according to their location in the Columbia River plume, ambient seawater, or inshore waters. This study is not a taxonomic survey of zooplankton, but provides abundance and distribution of copepods which are either abundant throughout the year or show marked seasonal variability. A checklist of copepods species identified from the samples is included. (Jones-Wisconsin)
W75-01512

FLAX POND: AN ESTUARINE MARSH,
Brookhaven National Lab., Upton, N.Y.
G. M. Woodwell, and E. V. Pecan.
Available from the National Technical Information Service, Springfield, Va. 22161, as BNL-50397, $4.00 in paper copy, $2.25 in microfiche. Report BNL-50397, June 1973. 7 fig, 4 tab, 3 ref.

Descriptors: *Baseline studies, *Estuaries, *Marshes, Tides, Topography, History, Hydrology, Vegetation, Physical properties, Water chemistry, Sediments, Fish, Ecosystems, Productivity.
Identifiers: *Flax Pond(Long Island-NY), Spartina alterniflora.

Research has been developed around an estuarine marsh, Flax Pond, in the Village of Old Field on Long Island's north shore. The marsh is connected to Long Island Sound through a single channel and is flushed twice daily by the tide. Amount of freshwater entering the marsh is small. The topography is simple enough that there is a possibility of making detailed budgets of inputs and outputs of carbon and other nutrients essential for life. This report describes the marsh--its history, topography, vegetation, hydrology, and physical dimensions--and outlines current research. At high tide, the area of water is about 574,000 sq m; volume is about 880,000 cu m; salinity averages 26%; mean tidal range is about 1.8 m. The tidal pattern varies little over the year; the duration of ebb tide is usually two hours longer than that of the flood due to a sill in the entrance of the channel. Principal vegetation is Spartina alterniflora. Details of the pond's structure and function are being accumulated to the point where this estuarine marsh is one of the most throughly known such sites in the world. Chemistry, sediments, vegetation, and fish are described. (Jones-Wisconsin)
W75-01513

BLUE-GREEN ALGAL GENETICS: A NEW METHODOLOGY,
Delaware Univ., Newark. Dept. of Chemistry.
M. P. Kraus.
Available from the National Technical Information Service, Springfield, Va. 22161, as COO-3007-24, $3.75 in paper copy, $2.25 in microfiche. (1973). 20 p, 4 fig, 4 tab, 37 ref.

Descriptors: *Cyanophyta, *Viruses, *Methodology, Genetics, Cytological studies, Radiation, Hosts.
Identifiers: Schizothrix calcicola, Lysis.

A methodology is proposed for inquiring into the nature of the algal chromosome. Over 30 strains of Schizothrix calcicola showing host range differences for at least one virus have been isolated. The blue-green algal virus, S-3, whose serology, plaque morphology, and host range differs from the two viruses, LPP-1 and LPP-2, has been introduced. The parent virus used was isolated from the Connecticut River by incubation on S. calcicola and plaque-picked from the sensitive host S. calcicola which produced uniform plaques distinguished by concentric pigmented rings. The radiation source was a Co-60 Cammacell 220. It was learned that the survival curves of a virus suspension, infecting or superinfecting various algal host cells after receiving increasing doses of Co-60 gamma radiation, differ in shape according to the host cells on which the irradiated virus is incubated or plated. The slopes of these survival curves appear to undergo discontinuities which can be correlated with differences in host range and plaque type. This suggests that recombination may be taking place at chromosites or episites within the cell which may give specific information of the state of lysogeny of a host cell. (Jones-Wisconsin)
W75-01514

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W75-01515

AN ESTIMATE OF BENTHIC MACROFAUNAL PRODUCTION IN THE OFFSHORE MUD OF THE NORTHUMBERLAND COAST,
Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
For primary bibliographic entry see Field 2L.
W75-01601

A BIOASSAY OF TOXICITY USING PROTOZOA IN THE STUDY OF AQUATIC ENVIRONMENT POLLUTION AND ITS PREVENTION,
Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena.
S. Aspostol.
Environ Res, Vol 6, No 4, p 365-372, 1973, Illus.
Identifiers: Aquatic environment, *Bioassay, Paramecium caudatum, Pollution abatement, *Protozoa, *Toxicity, Water purification, Water treatment.

Protozoa are of particular importance in nature playing an active role in water purification. Since they are increasingly used as toxicological models in medicine and pharmacology, protozoa could be employed advantageously in the field of water pollution. Methods are described for short-term/(acute) and long-term (chronic) toxicity evaluation in order to determine the degree of toxicity of various water-borne contaminants and to establish the tolerance to these agents. The technique consists in exposure of cultures of Paramecium caudatum in serial dilution tests (salt solutions) for short and extended time intervals. Results may be rapidly obtained within a few hours in the acute and within 2 wk in the chronic tests.--Copyright 1974, Biological Abstracts, Inc.
W75-01604

THE EFFECT OF WATER TEMPERATURE ON THE PENETRATION AND DEVELOPMENT OF ST. LUCIAN SCHISTOSOMA MANSONI MIRACIDIA IN LOCAL BIOMPHALARIA GLABRATA,
Saint Lucia Research and Control Dept., Castries.
For primary bibliographic entry see Field 2I.
W75-01618

5D. Waste Treatment Processes

APPEARANCE AND STABILITY OF HYDROLYZED FE(C104)3 SOLUTIONS,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5B.
W75-01102

SCREENING MODEL FOR STORM WATER CONTROL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
P. H. Kirshen, and D. H. Marks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE4, Proceedings paper No. 10712, p 807-820, August 1974. 2 fig, 2 tab, 8 ref. OWRT C-2137(No 3403)(7). 14-31-0001-3403.

Descriptors: *Combined sewers, *Environmental engineering, *Water management(Applied), *Storm water, *Water pollution, *Linear programming, Sanitary engineering, Size, Constraints, Simulation analysis, Flood control, Planning, Operations, Treatment facilities, Storage, Systems analysis, Mathematical models, *Ohio.
Identifiers: *Screening models, Sewer overflow, Local flooding, *Bloody Run Drainage Basin(Cincinnati-Ohio).

The problem of overflows and local flooding from combined sewer systems is reviewed. A linear programming screening model is used in planning for the control of storm water in combined sewer systems. The model screens the sizes and operating policies of conduits and storage and treatment facilities; the objective function is to minimize costs. The constraint set maintains physical continuity, sizes the facilities, and specifies water quality objectives. Described also is the EPA Storm Water Management Model, a detailed simulation model of combined sewer flows. A methodology is proposed in which the EPA model is used interactively with the screening model to plan for control of combined sewer overflow and local flooding. The simulation model determines the major areas of flooding and the magnitudes and quantities of the overflow. The screening model is then used to suggest an optimal control scheme, which is then analyzed with the simulation model. If results are satisfactory, sensitivity analysis can be performed using the screening model. A case study is made on the Bloody Run Drainage Basin, Cincinnati, Ohio. Results indicate that the screening model and the planning method are reliable. (Bell-Cornell)
W75-01110

CONTROL OF COMBINED SEWER OVERFLOW EVENTS,
Municipality of Metropolitan Seattle, Wash. Technical Services Dept.
For primary bibliographic entry see Field 5G.
W75-01138

LAND APPLICATION OF WASTEWATER,
Environmental Protection Agency, Washington, D.C. Municipal Waste Water Systems Div.
B. L. Seabrook.
Paper presented at the International Public Works Congress, American Public Works Association, Denver, Colorado, September 15-20, 1973. 52 p, 1 fig.

Descriptors: *Waste water disposal, *Sewer disposal, *Waste water treatment, *Soil disposal fields, Industrial wastes, Municipal wastes, Chemical wastes, Surveys, Bibliographies, Irrigation water, Groundwater recharge, Sprinkler irrigation, Application methods.
Identifiers: *Land application.

An on-site field survey was made of approximately 100 facilities in all climatic zones where community or industrial waste waters are being applied to the land, as contrasted to the conventional methods of treating such wastes and discharging them into receiving waters. The survey was conducted in 1972 by the American Public Works Association Research Foundation. Mail survey results, state health and water polution control regulations, information from foreign countries and an extensive bibliography of pertinent literature was gathered and studied. Presently, land application of wastewaters is being practiced successfully and extensively throughout the United States and other countries. Besides the beneficial and often-needed irrigation this method provides, the study concludes that: groundwater supplies are augmented, many of the community wastes need only secondary treatment and are nutritionally healthful to the soil, and increased crop production can be attained. Environmental analysis of existing facilities reflects general improvement of the surrounding areas. Industrial chemical wastes still need final treatment. Depending on location and availability of land, energy requirements could be either more or substantially less than other means of treatment. Sandy soil or forested areas appear to accept greater rates of application. It is recommended that the U.S. Environmental Protection Agency prepare guidelines and information on the wide choices of methods and procedures for the land applications outlined. (Poertner)
W75-01141

TREATMENT OF AQUEOUS SUSPENSIONS OF ORGANIC WASTE MATERIALS,
Shell Oil Company, New York, N.Y. (assignee)
E. J. Clayfield.
U S Patent No 3,838,045, 4 p, 8 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 926, No 4, p 1399, September 24, 1974.

Descriptors: *Patents, *Sewage sludge, *Organic wastes, *Suspension, *Waste water treatment, Pollution abatement.
Identifiers: Paper mill effluent, Chemical treatment, Mineral oil, Cationic surfactants.

A process is disclosed for dewatering an aqueous suspension of an organic waste material. The suspension is mixed with an acidified aqueous emulsion containing (a) from 10 to 100% by weight of a mineral oil based liquid having an initial boiling point above 200 deg C., and (b) from 0.01 to 10% by weight of an amino nitrogen-containing cationic surfactant or quaternary nitrogen-containing cationic surfactant. The weight percentages are based on the total weight of the solids present in the suspension. Next the mixture is subjected to filtration thereby obtaining an aqueous phase substantially free from organic substances and an organic waste material concentrate of increased calorific value. (Sinha-OEIS)
W75-01184

SEWAGE TREATMENT APPARATUS,
B. H. Stevenson.
U S Patent No 3,837,494, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 926, No 4, p 1266, September 24, 1974.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment, Sludge, *Settling basins, *Filters.

A sewage treatment system consists of a settling tank and a filtering tank, each tank having near its upper end an inlet and, at a slightly lower level, an opposite outlet. The outlet of the settling tank communicates with the inlet of the filtering tank. Each tank has in its nether region a downward progressively reducing cross section terminating in a floor provided with a central sludge withdrawal port. Each tank is provided with a downward extending baffle dividing its interior into two legs of unequal section communicating only near the tank floor. The filtering tank has an upflow filter near the upper end of its outlet leg. A downward flaring guard is concentrically suspended above each sludge withdrawal port and a lower section of each baffle is inclined to terminate above the apex of its associated guard substantially in the median vertical plane of the tank. (Sinha-OEIS)
W75-01186

SEWAGE TREATMENT APPARATUS,
Y-S. Lin.
U S Patent No 3,837,493, 6 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 926, No 4, p 1266, September 24, 1974.

Descriptors: *Patents, *Sewage treatment, *Aeration, Pollution abatement, Water pollution control, Water quality control, *Waste water treatment, Sedimentation, Equipment, *Activated sludge.

A sewage treatment package plant receives incoming raw sewage and purifies it by performing an activated sludge process. Oxygen for re-aeration of sludge in the stabilization and digestion stages of the process is supplied directly from aerated sewage in the aeration stage. The plant is of unitary structure and includes a partition to subdivide the interior into separate aeration, stabilization and sedimentation chambers with a separate digestion cavity being defined beneath the stabilization chamber. The sedimentation chamber has a volume sufficiently large to fully absorb the effects of shock loadings. Means are included for directing aerated sewage directly from the aeration chamber into the stabilization chamber and digestion cavity for reaeration of the sludge. (Sinha-OEIS)
W75-01187

IRRADIATOR FOR WATER PURIFICATION,
Water Purification Corp. of America, Washington, D.C. (assignee)
C. V. Ellison.
U S Patent No 3,836,781, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 1054, September 17, 1974.

Descriptors: *Patents, *Water purification, *Irradiation, *Sterilization, *Sewage treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment.

A description is given of an irradiator for sterilizing fluids, particularly contaminated effluents such as sewage. A housing is provided with a number of tubular partitions defining a flow path for causing sewage or effluents to flow, alternately, back and forth past a series of source tubes containing radioactive material whereby the sewage provides shields surrounding the radioactive source and becomes sterilized as it passes into and out of the housing. (Sinha-OEIS)
W75-01189

TREATMENT AND USE OF WASTE EFFLUENT STREAMS,
Lummus Co., Bloomfield, N.J. (assignee)
R. T. Whitehead, B. J. Luberoff, and M. C. Sze.
U S Patent No 3,836,461, 3 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 992, September 17, 1974.

Descriptors: *Patents, *Cooling towers, *Filtration, Pollution abatement, *Industrial wastes, *Chemical wastes, *Waste water treatment, Water pollution control, Water quality control, Effluent streams.
Identifiers: Volatile wastes, Vaporization, Chemical treatment.

An aqueous waste stream from an industrial chemical or other processing plant can be utilized to furnish cooling water for use in the same or another plant by partially vaporizing it in a cooling tower, after filtering off any suspended solids, utilizing the cooled liquid as cooling water for heat exchangers, and returning the heat-exchanged water to the cooling tower. Chemicals precipitated from the waste stream during vaporization can be recovered or burned as fuel in the plant. Small amounts of volatile wastes can be removed by vaporization in the cooling tower. Total recycle or elimination of all materials in the waste stream results in the reduction or elimination of pollution of local waters. (Sinha-OEIS)
W75-01190

PROCESS FOR REMOVAL OF ALGAE, DIATOMS AND ORGANIC CONTAMINANTS FROM WATER,
R. M. Willis, and C. L. Oldfather.
U S Patent No 3,836,460, 3 p, 1 fig, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 992, September 17, 1974.

Descriptors: *Patents, *Organic wastes, *Flocculation, *Filtration, Pollution abatement, *Waste water treatment, Water pollution control, Algae, Diatoms, Polymers, Floating, Skimming, Rivers, *Water treatment.

The bulk of algae, diatoms and other organic contaminants is effectively removed from river waters and other surface water preliminary to or concurrently with conventional flocculation processes. This is done by contacting the raw water with an amount of an organic cationic polyelectrolyte at a polymer dosage beyond the range where a visible floc is formed, generally 15 to 50 parts per million. The coalesced material is removed from the effluent by sparging finely dispersed air through the treated water to float the material. The floating material is removed by skimming or other suitable means. The treated effluent is then either flocculated by a conventional process or run directly through an inverted bed filter. (Sinha-OEIS)
W75-01191

MERCURY REMOVAL FROM LATEX PAINT WASTE WATER,
Petrolite Corp., St. Louis, Mo. (assignee)
R. A. Shoberg, and P. E. Cravens.
U S Patent No 3,836,459, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 991, September 17, 1974.

Descriptors: *Patents, *Paints, *Water pollution control, *Waste water treatment, Pollution abatement, Water quality control, *Mercury, Calcium hydroxide, Hydrogen ion concentration.
Identifiers: Latex paint, *Mercury compounds, Phosphoric acid.

A process for the removal of organic mercury compounds and dispersed solids from waste water generated in the manufacture of water-thinned paints is disclosed. The waste water receives an addition of phosphoric acid until the pH is adjusted to about 3.0. A major portion of the organic mercury compound (e.g., phenyl mercuric acetate) and water-dispersibled solids precipitate from the waste water. The precipitate is separated from the waste water. Then, the waste water is adjusted to a pH of at least about 7.5 by the addition of calcium hydroxide so that a substantially complete precipitation of the residual organic mercury compound and water-dispersibled solids is obtained. The precipitated solids are removed from the relatively mercury and solids free water phase. Then, the water phase is suitable for subsequent utilization. The precipitated mercury and solids may be treated to provide a substantially dry material suitable for landfill. (Sinha-OEIS)
W75-01192

WATER PURIFICATION MEANS,
Carborundum Co., Niagara Falls, N.Y. (assignee)
C. Wallis, and J. L. Melnick.
U S Patent No 3,836,458, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 991, September 17, 1974.

Descriptors: *Patents, *Water purification, *Filters, *Filtration, Pollution abatement, *Waste water treatment, Water pollution control, Water quality control, Viruses, Bacteria, Fungi, Molds, Algae.

The filtration system utilizes fabric filters treated with an inorganic sodium containing hydrolyzing composition. The fibers used may be in a variety of forms, including woven and non-woven fibers. Preferably a filter cartridge having a core element on which fabric or fibers are wound in successive layers is employed. In one type of filter cartridge, the fiber is first wound in successive layers in helical convolutions spaced along the core in one direction, and then in the opposite direction in a criss-cross manner. This provides a honeycomb filter cartridge with diamond shaped openings between successive layers. This winding results in passages extending from the outside of the unit to the inside thereof. During the winding of subsequent layers the strands are placed uniformly over the strands of previous layers. The fabric filter is treated with an inorganic hydrolyzing composition of matter containing sodium. The hydrolyzing composition can be contacted with the medium through any system that produces sodium hydroxide. Preferably the hydrolyzing composition is an aqueous solution of sodium hydroxide. (Sinha-OEIS)
W75-01193

TREATMENT FOR WASTE WATER OR THE LIKE,
ITT Industries, Inc., New York. (assignee)
H. E. Fries.
U S Patent No 3,836,456, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 990, September 17, 1974.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Aeration, Pollution abatement, Water pollution control, Water quality control, Equipment, *Sludge treatment.
Identifiers: Aluminum sulfate.

Water clarification and/or purification is achieved by establishing, in a first tank, vertically spaced floating and sunken sludge layers separated by a water layer that clears over a period of time. The raw waste is aerated in a second tank and thereafter withdrawn therefrom and injected with a precipitation agent including, but not limited to, a solution of aluminum sulfate into the clarified water layer at a vertical location spaced from both of the sludge layers. After the injection step is completed, the first tank is allowed to stand so that the water layer can again clear. At least a portion of the clarified water in the water layer is then removed therefrom at a vertical location between and spaced from the reformed sludge layers. The stratification of all three layers is fairly continuous except that the water layer must, over spaced periods, be allowed time to clear. Either one of the sludge layers may be drained off whenever the thickness of the one sludge layer becomes so great in comparison to the first tank depth that only an inefficiently small batch of aerated waste water can be pumped into the first tank to be clarified. (Sinha-OEIS)
W75-01194

PROCESS AND APPARATUS OF HANDLING WATER WHICH IS CONTAMINATED WITH AN OILLIKE LIQUID,
International Pollution Control Systems, Inc., Washington, D.C. (assignee)
P. Jakubek.
U S Patent No 3,836,000, 9 p, 18 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 926, No 8, p 879, September 17, 1974.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, Water pollution control, Water quality control, *Pollution abatement, Equipment, *Separation techniques, Ships, Oily water.
Identifiers: *Bilge water.

The object is to provide a process of removing oil from bilge water of ships. The apparatus comprises a bilge pump which is controlled by a float-controlled switch, and a pump which pumps off water which is contaminated with oil through an oil separator and, if desired, through an air separator. The oil separator has pressure-resisting housing, a filter for removing the oil, a supply conduit which incorporates a non-return valve and serves to supply the water, a discharge conduit for the purified water, and an air-venting valve; the air space disposed in the oil separator over the liquid is under pressure. Bags of plastic material serve to receive the oil which has been removed. (Sinha-OEIS)
W75-01196

REDUCING WATER POLLUTION FROM PULP MILL SULFITE WASTES,
Michigan Technological Univ., Houghton. Dept. of Chemistry and Chemical Engineering.
J. T. Patton, and M. F. Jurgensen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 340, $3.75 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, Lansing, October 1974. 33 p, 7 fig, 27 ref. OWRT B-027-MICH(2). 14-31-0001-3898.

Descriptors: Water pollution, Industrial wastes, Sulfite liquors, *Pulp wastes, *Anaerobic bacteria, Pollution abatement, *Waste water treatment, *Biological treatment, Water pollution control.
Identifiers: *Desulfovibrio, Anaerobic reduction, *Sulfite wastes.

To abate the pollution by pulp mills' discharge of spent sulfite liquor into streams and lakes a process utilizing sulfur reducing anaerobic bacteria of the genus Desulfovibrio was conceived. Cultures of these organisms obtained by soil enrichment were adapted to utilize the lignosulfonate present in spent sulfite liquor as both a source of carbon and of sulfur. Sulfur was metabolized to H2S and can be recycled in the pulping process. Any organic fragments of the molecule not converted to CO2 appear to lose insolubility and can be recovered as sludge disposal or conversion into useful organic products. Some lignosulfonate molecules were readily metabolized; however, the rate of digestion slowed preceptibly with time. The decrease in rate appears to be due to the varying resistance of different sulfur bonds to enzymatic breakdown. The loosely bound sulfur is easily removed during the first 5 days fermentation. Digestion of the tightly bound sulfur decreases drastically and complete removal does not appear feasible. During the initial 5 day fermentations sulfur reductions of 20% coupled with the COD reduction of 30% were consistently obtained. The higher percentage of COD is due to the presence of easily metabolized organics containing no sulfur which are initially present in spent sulfite liquor. It is believed that additional research could identify methods of increasing the metabolic removal of the tightly bound sulfur. Such a breakthrough could lead to the development of this process into a solution to the severe pollution problem now facing the sulfite pulping industry.
W75-01200

CATALYTIC OXIDATION OF PHENOL DILUTE CONCENTRATION IN AIR,
Delaware Univ., Newark. Dept. of Chemical Engineering.
M. A. Walsh, and J. R. Katzer.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 458, $3.25 in paper copy, $2.25 in microfiche. Presented at: 74th National Meeting, American Institute of Chemical Engineers, New Orleans, Louisiana, March 11-15, 1973. 20 p, 3 fig, 2 tab, 27 ref. OWRT A-014-DEL(3).

Descriptors: *Phenols, *Oxidation, *Catalysts, *Industrial wastes, *Analytical techniques, *Waste water treatment, Organic compounds, Water pollution treatment, Chromatography, Copper compounds, Aqueous solutions, Taste, Odor, Oil wastes, Copper, Chemical reactions, Aluminum, Kinetics, Gas chromatography, Air pollution.
Identifiers: *Catalytic oxidation, Vapor-phase, Copper oxide, Alumina, Waste streams, Aqueous phase, Arrhenius behavior, Total organic carbon, Organic emissions, Odor control, First-order kinetics.

The vapor-phase catalytic oxidation of phenol over copper oxide on alumina was studied in a fixed-bed tublar reactor between 150C and 270C in the presence of excess water vapor. Catechol, hydroquinone and organic acids, which are reported to form in appreciable quantities in the homogeneous oxidation of phenol, were not observed in the vapor-phase catalytic oxidation. An organic intermediate, probably p-benzoquinone, occurred in appreciable quantities in the heterogeneous oxidation at intermediate phenol conversions. At moderate temperatures (about 250C) and low conversions (about 30%) approximately one-half of the phenol oxidized was converted completely to CO2 and H2O. This indicated that ring opening was a relatively difficult step followed by more rapid subsequent oxidation steps. At higher conversions little CO was formed. The vapor-phase oxidation was first order with respect to phenol over the range of conditions studied and exhibited an Arrhenius activation energy of 10 kcal/mole. (Henley-ISWS)
W75-01207

ADVANCED WASTE WATER TREATMENT,
Canberra Housing and Construction Dept. (Australia). Major Development Section.
D. M. Philp.
Water (Journal of the Australian Water and Wastewater Association) Vol 1, No 2, p 8-16, June 1974. 5 fig, 1 tab, 18 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Project planning, *Design criteria, Cities, Pollution effects, Recreation demand, *Waste water treatment, Rivers, Reservoirs, Nitrogen compounds, Phosphorus compounds, Nutrient removal, *Australia.
Identifiers: *Canberra(A.C.T.), Murrumbidgee River, Molonglo River, Burrinjuck Reservoir.

The development of inland cities presents a particular problem for the treatment and disposal of urban effluent in Australia, because of the limited 'sink' provided by its relatively small and few river systems. The effect of Canberra's effluent on the waters of the Murrumbidgee River, and of Burrinjuck Reservoir, a site of increasing recreational importance to the residents of the canberra area, is summarized. Recognition of the effects has stimulated the establishment of a Water Quality Control Centre at the junction of the Molonglo and Murrumbidgee Rivers. The design of the plant is described, with details of design loadings for initial and final developments, site layout and the sequence of treatment processes. (See also W75-01249) (CSIRO)
W75-01248

ADVANCED WASTE WATER TREATMENT (PART II),
Canberra Housing and Construction Dept. (Australia). Major Development Section.
D. M. Philp.
Water (Journal of the Australian Water and Wastewater Association) Vol 1, No 3, p 11-19, September 1974. 3 fig,

Descriptors: *Treatment facilities, *Sewage treatment, *Nutrient removal, *Sludge treatment, *Cost comparisons, Water quality control, Nitrogen compounds, Phosphorus compounds, *Waste water treatment, Sludge disposal, Denitrification, Activated sludge, Biological treatment, *Australia.
Identifiers: Molonglo River(A.C.T.).

Details are given of the choice of treatments for use in the Lower Molonglo Water Quality Control Centre. Costs and effectiveness are compared with other available processes. The processes discussed in detail are the removal of phosphorus from waste water, the reduction of nitrogen levels in waste water, and the handling and disposal of sludge. The methods adopted were, respectively, chemical precipitation with lime, biological nitrification-denitrification using an activated sludge process, and multiple hearth furnaces. (See also W75-01248) (CSIRO)
W75-01249

PROBLEMS OF LIQUID WASTE DISPOSAL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
B. W. Gould.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 71-74, 1974. 10 ref.

Descriptors: *Water pollution, Water pollution sources, Water pollution effects, Pollutants, *Water treatment, *Reviews, Waste treatment, Water quality, Treatment facilities, Environmental engineering, *Waste disposal, Liquid wastes, *Waste water treatment.

With increasing population growth and a greater diversity of industrial processes with their associated wastes, the range of recognized pollutants and pollutant effects has increased greatly in recent times. The technology of water treatment has expanded rapidly in response to the new challenges, and engineers need adequate training to maintain an awareness of the developments. The types of water pollution now encountered are reviewed, with special reference to those more recently recognized, and some problems in the treatment of water to deal with them are discussed. (CSIRO)
W75-01252

MATHEMATICAL PROCESS MODEL FOR 'WASHING-EVAPORATION-BIOLOGICAL PURIFICATION'. 2. APPLICATION TO A TOTAL SYSTEM STUDY (MODELE MATHEMATIQUE DE FABRICATION 'LAVAGE-EVAPORATION-EPURATION BIOLOGIQUE'. 2. APPLICATION A L'ETUDE DE L'ENSEMBLE),
Centre Technique de l'Industrie des Papiers, Cartons et Celluloses, Grenoble (France).
E. Muratore, and P. Monzie.
Revue ATIP (Association Technique de l'Industrie Papetiere), Vol 28, No 1, p 1-7, 1974. 8 fig, 3 tab, 3 ref.

Descriptors: *Mathematical models, Model studies, *Computer models, Pulp and paper industry, *Pulp wastes, Treatment facilities, *Optimization, Pollution abatement, *Water pollution control.

A mathematical model is described for determination of the optimum technology and economy of pulp manufacture, especially pulp washing, spent liquor evaporation, and waste water purification. Using a hypothetical kraft mill of 400 daily ton (bleached pulp) capacity, the model was useful in calculating optimized costs, not including amortization of washing equipment. One result indicated that it is not feasible to ascertain the overall ground rules defining optimum conditions in all cases. Such an optimum can change when effluents require purification, depending on local conditions, the pulpwood species used, the mill's location, the energy demand of the recovery system, and even governmental aid to pollution control. (Wise-IPC)
W75-01260

WASTE FROM WASTEPAPER UTILIZATION,
National Council of Air and Stream Improvement, Boston, Mass.
For primary bibliographic entry see Field 5B.
W75-01261

LONG-TERM BOD DETERMINATIONS ON BIOLOGICALLY TREATED AND UNTREATED KRAFT MILL EFFLUENT DISCHARGED TO LAKE SAIMAA, FINLAND,
National Water Board of Finland, Helsinki. Research Inst.
For primary bibliographic entry see Field 5B.
W75-01264

ENGINEERING APPROACH TO A SECONDARY TREATMENT SYSTEM,
Packaging Corp. of America, Filer City, Mich.
D. L. Voigts, and E. S. Savage.
Tappi, Vol 57, No 6, p 96-100, June 1974. 2 fig, 2 tab.

Descriptors: *Waste treatment, Treatment facilities, *Michigan, *Pulp wastes, *Waste water treatment, Lakes, *Waste water(Pollution), Pollution abatement, Water pollution control, Aerated lagoons, Activated sludge, Biological treatment, Sewage treatment, Basins, Aeration, Equipment, Pipelines, Aquifers, Effluents, Sludge treatment, Dewatering, Centrifugation, Air pollution, Incineration, Clays, Engineering structures, Erosion control, *Michigan.
Identifiers: Neutral sulfite semichemical pulp mills.

The integrated NSSC (neutral sulfite semichemical) pulp and paper mill of PCA is located near Lake Manistee, a coho salmon fishing area. Primary waste water treatment facilities installed in 1958 included a 5-mile pipeline to carry primary effluent to Lake Michigan. Ten years later, a secondary treatment system was planned and investigated for optimized process design parameters. The total system features nutrient addition (anhydrous ammonia plus phosphoric acid), an activated sludge process in two clay-lined aeration basins (1200-hp aeration capacity), two secondary clarifiers, sludge-dewatering and conditioning equipment, basket centrifuges for dewatering excess biological sludge, and a fluidized-bed incinerator plus air pollution control. The compaction of the clay liner for impermeabilization and erosion control of aeration basins is highlighted, and operating experiences for the first eight months after startup are reported. (Witt-IPC)
W75-01266

EXPERIENCES WITH DEWATERING OF SLUDGES FROM A PURIFICATION PLANT FOR CHEMICAL INDUSTRY EFFLUENT,
Farbwerke Hoechst, Frankfurt am Main (West Germany).
A. Bauer, and K. Trobisch.
Transl. avail. for $7.50 from Institute of Paper Chemistry, Appleton, Wis. 54911. Translation from: Chemie-Ingenieur-Technik, Vol 46, No 7, p 288, 1974. 1 fig.

Descriptors: *Sludge disposal, *Sludge treatment, Waste disposal, *Dewatering, Ultimate disposal, *Industrial wastes, *Waste treatment, *Filtration, Filters, Centrifugation, Vacuum drying, Incineration, Pressure, Equipment, Treatment facilities.
Identifiers: Vacuum filters, *Filter presses.

A brief report is given on the treatment of sludge from a chemical industrial effluent treatment plant in a preliminary thickening (dewatering) stage, followed by a vacuum filter, a filter press, or a decanter centrifuge. A cost comparison of the three second-stage alternatives indicates the vacuum filter to be the most and the centrifuge the least expensive. However, if the disposal of thickened sludge (by incineration and/or dumping) is included, the filter press appears most economical. (Speckhard-IPC)
W75-01267

BIOLOGICAL DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENT,
B.C. Research Ltd., Vancouver.
J. C. Mueller, and C. C. Walden.
Pulp and Paper Magazine of Canada, Vol 75, No 8, p 48-54, (Technical Paper T274), Aug 1974. 8 fig, 5 tab, 12 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, Waste treatment, *Waste water treatment, *Activated sludge, *Biological treatment, *Biochemical oxygen demand, *Toxicity, Surges, Temperature, Effluents.
Identifiers: Kraft mills.

Four biological (activated sludge) effluent treatment systems were operated with and without surge equalization at various temperatures, and compared for efficiency of five-day BOD and toxicity removals from bleached kraft mill total effluent. Without surge equalization, the BOD removal remained nearly unchanged, but the detoxification dropped by 15-30%. A temperature range of 60-90F had no significant impact on system performance. (Brown-IPC)
W75-01269

PROCESS PARAMETERS OF FOAM DETOXIFICATION OF KRAFT EFFLUENT,
B.C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Pulp and Paper Magazine of Canada, Vol 75, No 7, p 101-106, (Technical Paper T263), July 1974. 7 fig, 4 tab, 17 ref.

Descriptors: *Foam separation, *Pulp wastes, *Bleaching wastes, *Toxicity, Costs, *Operating costs, Waste treatment, *Waste water treatment, Pollution abatement, Water pollution control, Pulp and paper industry, Hydrogen ion concentration, Temperature, Bubbles, Suspended solids, Fibers(Plant).
Identifiers: Process variables, Kraft mills, Batch process, Continuous process.

The technical feasibility of detoxifying bleached kraft mill total effluent by foam separation was studied in batch and continuous systems. Process variables investigated included gas/liquid ratio, pH, temperature, and column height. Results

showed that total kraft effluents can be detoxified by foam separation at a cost below $1 per ton of pulp produced. Suspended fibrous solids are removed with the foam. Process efficiency depends mainly on pH, bubble size, and gas/liquid ratio. (Buchanan-IPC)
W75-01270

COLOR OF PULP INDUSTRY WASTE LIQUORS. V. CONTRIBUTION OF WOOD COMPONENTS TO THE COLOR OF WASTE LIQUORS FROM KRAFT AND SULFITE PULPING (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W75-01271

THE USE OF CHITOSAN COLUMNS FOR THE REMOVAL OF MERCURY FROM WATERS,
Ancona Univ. (Italy). Faculty of Medicine.
For primary bibliographic entry see Field 5A.
W75-01273

DETAILED COST OF SOME BIOLOGICAL WASTE TREATMENT SYSTEMS FOR THE PULP AND PAPER INDUSTRY,
Van Luven Consultants Ltd., Montreal (Quebec).
R. Van Soest, and R. P. Cheek.
Canadian Pulp and Paper Association Technical Section Papers and Discussions, No 1, p D17-D22, July 1974. 1 fig, 5 tab, 6 ref.

Descriptors: *Pulp wastes, Waste treatment, *Treatment facilities, *Waste water treatment, Water pollution treatment, Pollution abatement, *Biological treatment, *Activated sludge, Costs, *Capital costs, *Operation costs, Lagoons, Aerated lagoons, Economic efficiency.
Identifiers: Zurn-Attisholz process.

The performance and capital plus operating costs of the Zurn-Attisholz two-stage high-rate activated sludge process for treatment of effluents from a bleached kraft and a sulfite/newsprint mill (of hypothetical typical capacities) are compared with those of other conventional effluent treatment systems. The false economy of lagoons and their inflexibility in upgrading the degree of treatment are pointed out as major short-comings that are absent from the Attisholz process. (Brown-IPC)
W75-01274

REGENERATION OF SPENT GRANULAR ACTIVATED CARBON USED FOR KRAFT PULP WASTE TREATMENT: EFFECTS OF REGENERATION TIME AND STEAM QUANTITY ON REGENERATED ACTIVATED CARBON (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
I. Akamatsu, T. Kobayashi, and H. Kamishima.
Japan Tappi, Vol 28, No 7, p 329-333, July 1974. 5 fig, 3 tab, 9 ref. English summary.

Descriptors: *Activated carbon, *Adsorption, *Color, *Pulp wastes, *Lignins, Waste treatment, *Waste water treatment, *Recycling, *Operating costs, Steam, Porosity, Effluents, Incineration.
Identifiers: Chemical recovery.

Activated carbon which had been used for purification of kraft pulp mill effluents was regenerated by treatment in a steam atmosphere at 830C for various lengths of time. Mercury porosimetry and other test methods showed that the pore volume, the iodine number, and the decoloring capacity (toward methylene blue) of the carbon increased with prolonged steam treatment. The lignin-adsorbing capacity reached a maximum after 35 min of steaming. At this constant regeneration time, the amount of inlet steam changed from 40 to 160 ml/min (expressed as water). The combustion loss of activated carbon increased with increasing volume of inlet steam. (Brown-IPC)
W75-01275

EFFLUENT PROBLEMS AND WATER POLLUTION IN THE PAPER INDUSTRY (PROBLEMAS Y VERTIDOS DE AGUAS O DE CONTAMINACION DE LAS MISMAS POR LA INDUSTRIA PAPELERA),
Torras Hostench S.A. (Spain).
A. Xucla Bas.
Investigacion y Tecnica del Papel (Madrid), Vol 11, No 39, p 129-134, Jan 1974. English summary.

Descriptors: *Pulp wastes, Waste treatment, *Waste water treatment, *Pollution abatement, *Water pollution control, *Reviews, Effluents, Incineration, Biological treatment, Activated sludge, Filtration, Crystallization, Closed circuits, Electrodialysis, Bleaching wastes, Oxygen.
Identifiers: Pyrolysis, Chemical recovery, Spent pulping liquors, Oxygen bleaching.

Efforts and technical developments in the paper industry toward control of water pollution are reviewed, including: physical-chemical processes for treatment and recovery of spent pulping liquors (by combustion, vacuum crystallization, pyrolysis, electrodialysis, etc.); reduction of effluent pollution loads (through introduction of oxygen bleaching, closure of the paper machine white water circuit, etc.); and biological-chemical methods (activated sludge treatment and filtration) for effluent purification. (Speckhard-IPC)
W75-01276

MAGNETIC TREATMENT OF AQUEOUS SUSPENSIONS (MAGNITNAYA OBRABOTKA VODNYKH SUSPENII),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
I. Ya. Podchernyaev, and I. V. Kisilenko.
Bumazhnaya Promyshlennost', No 5, p 22, May 1974. 1 fig.

Descriptors: *Pulp wastes, *Suspended solids, Waste treatment, *Waste water treatment, *Electromagnetic waves, *Magnetic studies, Sedimentation, Separation techniques, Water pollution control, Pollution abatement, Clays, Fibers(Plant).

Sedimentation rates were measured for aqueous suspensions of kaolin clay, unbleached pulp, and bleached pulp fibers which had passed through a magnetic field generated in a system of ten electromagnets of alternating polarity at a rate of 0.2 m/sec. Compared to untreated suspensions, the magnetic treatment greatly accelerated the sedimentation of solid particles, apparently due to the formation of particle aggregates accompanied by an 'avalanche' effect. The degree of acceleration was directly related to the strength of the magnetizing current. Magnetic treatment holds promise of replacing the use of sedimentation aids, such as surface-active agents, in pollution-abatement systems. (Stapinski-IPC)
W75-01277

HOW REALISTIC IS FODDER YEAST PRODUCTION FROM WOOD INDUSTRY WASTE PRODUCTS. (HUR REALISERA FODERJASTTILLVERKNING PO SKOGSINDUSTRIELLA AVFALLSPRODUKTER.),
Svenska Traforskningsinstitutet, Stockholm.
M. Ek, and K.-E. Eriksson.
Svensk Papperstidning, Vol 77, No 9, p 301-302, May 25, 1974. 1 fig.

Descriptors: *Proteins, Food abundance, *Fermentation, *Industrial wastes, *Wood wastes, *Sulfite liquors, *Pulp wastes, *Carbohydrates, Lignins, *Yeasts, Europe, Foreign research, Potatoes.
Identifiers: Sweden, Finland, Switzerland, Starch.

The technology and economics of feed yeast production from spent sulfite pulping liquors and other lignocellulosic wastes are discussed. Conventional sources of cheap fodder proteins, such as soy beans and fish meal, are becoming more expensive, and the world's need for protein is increasing. Since many sulfite pulp mills in Scandinavia have shut down, owing to environmental regulations, wood wastes and recycled fibers have become targets for protein-yielding fermentation processes, notably in Switzerland, Finland, and other countries. A starch-coverting company in Sweden (Svenska Sockerbolaget) has started production of yeast from starch-containing effluents of a potato-processing factory. (Kaustinen-IPC)
W75-01278

OZONATION OF A KRAFT MILL EFFLUENT,
Glatfelter (P. H.) Co., Spring Grove, Pa.
H. D. Bauman, and L. R. Lutz.
Tappi, Vol 57, No 5, p 116-119, May 1974. 5 fig.

Descriptors: *Ozone, *Waste water treatment, Waste treatment, *Pulp wastes, *Color, Effluents, Dissolved oxygen, Suspended solids, Chemical oxygen demand, Biochemical oxygen demand, Coliforms, Aquatic microorganisms, Sterilants, Waste water(Pollution), Industrial wastes, Water pollution treatment, Pollution abatement, Pilot plants.
Identifiers: Kraft mills.

The total combined effluent from an integrated bleached kraft pulp and paper mill was subjected to ozone treatment in a 5 gal/min pilot plant after primary and secondary treatment. Application of 30-40 ppm of ozone achieved 60-70% color reduction in the effluent from secondary treatment; larger doses of ozone gave little further benefit. Although ozonization increased the 5-day BOD by 100%, the treated effluent contained over 20 ppm of dissolved oxygen. Treatment with 40 ppm of ozone did not completely sterilize the waste water, but significantly reduced the coliform count. Color removal efficiency depended on the initial color level, the ozone dosage, the COD, and the suspended solids load, but was independent of the ozone concentration in the feed gas stream. (Buchanan-IPC)
W75-01279

POLLUTION: PANELS AND TROUT (POLLUTION: DES PANNEAUX ET DES TRUITES).
Papier, Carton et Cellulose, Vol 23, No 1/2, p 48-51, Jan-Feb 1974. 4 illus.

Descriptors: *Pulp wastes, *Water pollution control, *Pollution abatement, Waste treatment, *Waste water treatment, Europe, *Water reuse, *Recirculated water, *Closed conduits, *Trout, Fish, Waste water(Pollution).
Identifiers: *France.

A water-pollution control program at a wet-process fiberboard mill (Isorel de Casteljaloux, France) is outlined. After limited progress with various effluent-purification methods, success was attained by closure of the water circulation system, resulting in a 99.3% reduction of the pollution load. (Speckhard-IPC)
W75-01280

ACTIVATED CARBON FROM BARK FOR EFFLUENT TREATMENT,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
D. G. MacDonald, and T. G. Nguyen.
Pulp and Paper Magazine of Canada, Vol 75, No 5, p 97-101, May 1974. (Technical Paper T199) 7 fig, 1 tab, 22 ref.

Descriptors: *Activated carbon, *Adsorption, *Color, *Chemical oxygen demand, *Bark, *Solid wastes, *Pulp wastes, *Bleaching wastes, *Waste treatment, *Waste water treatment, Steam, Soft-

wood, Coniferous trees, Pine trees, Effluents, Temperature.
Identifiers: Charcoal, Spruce trees, Kraft mills, Bleach plants, Pyrolysis, Alkaline extraction(Pulp).

Charcoal was prepared by pyrolyzing a bark mixture from white spruce (Picea glauca) and jack pine (Pinus banksiana). The charcoal was activated by steam treatment at 871C (1600F). Yields of activated carbon depended on the activation time; they ranged from 12% to 20%, based on air-dry bark weight. Using 10 g/liter of such activated carbon for treatment of the alkaline extraction effluent of a kraft mill bleach plant (containing 1200 ppm of COD) resulted in 95% color removal and 75% COD removal. (Buchanan-IPC)
W75-01284

REDUCTION OF WATER CONSUMPTION IN THE MANUFACTURE OF BOXBOARD AND BAG PAPER (SOKRASHCHENIE VODOPOTREBLENIYA PRI PROIZVODSTVE TARNOGO KARTONA I MESHOCHNOI BUMAGI),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
For primary bibliographic entry see Field 3E.
W75-01285

EXTRACTION OF GUAIACOL FROM AQUEOUS SOLUTIONS (EKSTRAKTSIYA GVAYAKOLA IZ VODNYKH RASTVOROV),
Ya. I. Korenman.
Zhurnal Prikladnoi Khimii, Vol 46, No 6, p 1305-1309, June 1973. 4 fig, 1 tab, 7 ref.

Descriptors: *Aqueous solutions, *Lignins, Pollutants, *Separation techniques, *Phenols, Solvents, Solutes, *Molecular structure, Pollution abatement, *Pulp wastes, Organic compounds, Alcohols, Aromatic compounds, *Solvent extractions, Waste water treatment, Pollutant identification.
Identifiers: *Guaiacol.

A study was conducted of the distribution of guaiacol (a lignin model compound or degradation product) between water and 25 different organic solvents during extraction from the aqueous phase. Using aliphatic alcohols as solvents, the amount of guaiacol residue in the water decreased linearly with the carbon chain length of the alcohol molecule. Among aromatic solvents, the ability to extract guaiacol from water increased by the presence of aliphatic side-chains and decreased when nitro groups were present in the molecules. (Chern-IPC)
W75-01286

FOUR BIOLOGICAL SYSTEMS FOR TREATING INTEGRATED PAPER MILL EFFLUENT,
Crown Zellerbach Corp., Camas, Wash.
H. T. Chen, E. E. Fredrickson, J. F. Cormack, and S. R. Young.
Tappi, Vol 57, No 5, p 111-115, May 1974. 5 fig, 5 tab, 11 ref.

Descriptors: Waste treatment, *Waste water treatment, *Pulp wastes, Treatment facilities, *Biodegradation, *Activated sludge, *Trickling filters, *Pilot plants, *Aerated lagoons, Surfaces, *Biological treatment, Filters, Organic loading, Biochemical oxygen demand, Hydrogen ion concentration.
Identifiers: Rotating biological surfaces(RBS), Kraft mills, Groundwood pulp mills.

Pilot plants using oxygen-aided activated sludge, rotating biological surfaces (RBS), plastic trickling filters, or aerated stabilization basins were operated for three months and evaluated for their ability to purify waste waters from an integrated bleached kraft and groundwood pulp mill. The feed liquor was a mixture of bleach plant effluent and primary clarifier discharge, which was passed through the four pilot units under different loading conditions. The oxygenated activated sludge system consistently removed nearly 90% of BOD at loadings of 125 to 175 lb BOD/1000 cu ft/day and nutrient:microorganism ratios of 0.41 to 0.76 lb BOD/lb of MLVSS (mixed liquor volatile suspended solids)/day. At a hydraulic loading of 1.5 gal/day/sq ft of surface area or a BOD load of 2.5 lb/1000 sq ft/day, the RBS unit attained 90% BOD removal, but better removals were achieved at lower loadings. The trickling filter system removed 72% BOD (at 62 lb/1000 cu ft/day), but only 39% at increased loads (132 lb/1000 cu ft/day). The aerated basin removed 83% BOD at 7.6 days of theoretical hydraulic detention time. All four systems were more or less susceptible to abrupt pH changes and to organic spills; recovery times after a system upset were 2-3 days. (Buchanan-IPC)
W75-01287

PROBLEMS IN TREATMENT OF WATER AND SOLUTIONS IN A HARDBOARD MILL (PROBLEMATICA DE TRATAMIENTO DE AGUA Y SOLUCIONES EN UNA PLANTA DE HARD BOARD),
Fibracel S.A. (Mexico).
J. L. Armendariz Blazquez.
ATCP (Associacion Mexicana de Tecnicos de las Industrias de la Celulosa y del Papel), Vol 14, No 1, p 25-32, Jan-Feb, 1974. 4 fig. English summary.

Descriptors: Freshwater, Rivers, *Industrial water, Water pollution effects, *Mexico, *Pulp and paper industry, *Water supply, *Water quality, Water pollution, Surface waters, *Waste water treatment.
Identifiers: Hardboard mills, Valles River(Mexico), La Planta Fibracel SA.(Mexico), Paper defects.

The quality of the water supply of La Planta Fibracel SA., a wet-process fiberboard mill on the Valles River, Mexico, was investigated, including its chemical composition, volume flow, rainfall augmentation, and pollutants which gave rise to surface stains in the hardboards produced. The application of paraffin emulsion to the fiber mats was found to give a more economical control of surface defects than would have the use of well water or the clarification of the river water by chemical or other means. (Speckhard-IPC)
W75-01288

FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA,
Smith (Wilbur) and Associates, Denver, Colo.
For primary bibliographic entry see Field 5G.
W75-01289

MICROBIAL ACTIVITIES DURING SEWAGE TREATMENT IN LAGOONS I. CHANGES IN AEROBIC AND ANAEROBIC BACTERIA, ACTINOMYCETES, FUNGI, II. CHANGES IN DIFFERENT TYPES OF FUNGI, III. CHANGES IN BOD AND DEHYDROGENASE ACTIVITY,
Tuskegee Inst., Ala. Dept. of Agricultural Sciences.
For primary bibliographic entry see Field 5B.
W75-01318

PE PIPE USED AT OXFORD PAPER.
Pulp and Paper, Vol 48, No 5, p 119, May 1974. 1 illus.

Descriptors: *Pipelines, Discharge(Water), Pulp wastes, Industrial wastes, Water conveyance, *Conveyance structures, *Conduits, *Canals, Waste water(Pollution), Waste treatment, *Maine, Pulp and paper industry, *Waste water treatment.
Identifiers: Groundwood pulp mills.

Aqueous effluents discharged by Oxford Paper Co.'s groundwood mill at Rumford, Maine, are being conveyed to the main waste treatment plant of the mill in a polyethylene pipeline submerged in an existing canal. (Witt-IPC)
W75-01371

OZONE-ACTIVATED SLUDGE TREATMENT OF SULPHATE PULP WASTE WATER: MECHANISM OF BOD REMOVAL, TREATMENT CONDITIONS, AND SEQUENTIAL TREATMENT (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
H. Kamishima, and I. Akamatsu.
Japan Tappi, Vol 28, No 8, p 368-377, Aug 1974. 13 fig, 2 tab, 13 ref. English summary.

Descriptors: *Pulp wastes, *Ozone, *Waste treatment, *Waste water treatment, *Chemical oxygen demand, *Biochemical oxygen demand, *Activated sludge, *Biological treatment, Kinetics, Chemical reactions, Sludge, Oxygen demand, Foreign research, Pollutants, Manganese.
Identifiers: Kraft mills, Black liquors, Ozonization.

Although high removals of color and Mn-caused COD were achieved earlier by ozone treatment of kraft pulp mill effluents, the process led to the formation of BOD components. The mechanism of BOD removal under different operating conditions was, therefore, studied on an ozonized dilute black liquor subjected to activated sludge treatment. When applying the Eckenfelder equation and the two-phase theory, the BOD removal was found to proceed in phase II. With initial BOD loadings of ca. 600 mg/liter, the removal rate could be approximated as a first-order chemical reaction, whereas second-order kinetics were obeyed at initial BOD loads of 100-200 mg/liter. BOD removals above 90% were attained at loads below 0.5 kg of BOD per kg of MLVSS (mixed liquor volatile suspended solids) per day. Sludge yields were equal to, or below, those for other pulp mill waste waters, and the total oxygen consumption was about the same. In the case of ozonized liquor containing 4.0-15.0 mg/liter of residual ozone, the BOD removal efficiency decreased at high BOD loads, but not at loadings below 0.4 kg BOD/kg MLVSS/day. In a two-stage ozone-aided activated sludge treatment of dilute black liquor, the total COD (Mn) and BOD removal efficiencies were found to depend on the efficiencies of the individual stages. They amounted to 61.6% and 87.5%, respectively, even when the ozone residual was 0.4 mg/liter in the mixer effluent and 0.08 mg/liter in the gas supplied to the aeration tank. Lignin-removal and color-removal efficiencies depended on the effectiveness of the ozone stage and amounted to 66.6% and 81.5%, respectively. (Brown-IPC)
W75-01377

SPECTROSCOPIC METHOD FOR THE QUANTITATIVE DETERMINATION OF PULP IN ACTIVATED SLUDGE (SPEKTROSKOPICHESKII METOD KOLICHESTVENNOGO OPREDELENIYA TSELLYULOZY V AKTIVNOM ILE),
Vsesoyuznyi Nauchno-Issledovatel'skii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR).
For primary bibliographic entry see Field 5A.
W75-01378

DISPOSING OF INDUSTRIAL WASTES: THE PAPER INDUSTRY (SMALTIMENTO RIFIUTI INDUSTRIALI: INDUSTRIA DELLA CARTA),
Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy).
D. Borruso.
Industria della Carta, Vol 12, No 2, p 43-48, Feb 1974. 16 ref. English summary.

Descriptors: *Pulp wastes, *Waste disposal, *Waste treatment, *Waste water treatment, Pulp and paper industry, Sulfite liquors, Effluents, Water pollution control, Pollution abatement, Water pollution sources, Byproducts.

This review of various types of wastes produced and disposed of by the pulp and paper industry discusses bark and wood waste, spent pulping liquors from kraft and sulfite mills, paper machine white waters, and by-product recovery, as well as various methods for handling (treating) wastes prior to disposal. (Speckhard-IPC)
W75-01379

SURVEY OF PULP AND PAPER INDUSTRY ENVIRONMENTAL PROTECTION EXPENDITURES AND OPERATING COSTS -- 1973,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. O. Blosser, and G. Gove.
NCASI Special Report No. 74-01, July 1974. 15 p, 2 tab.

Descriptors: *Pulp and paper industry, Environmental control, Environmental engineering, *Treatment facilities, *United States, *Costs, *Expenditures, *Pollution abatement, *Water pollution control, Air pollution, *Operating costs, Capital costs, Research and development, Economics, Surveys, Data collections, Waste treatment, Waste water treatment.

The results of a survey identify and summarize capital expenditures made by the U.S. pulp and paper industry in 1973 and planned for 1974 through 1976 for air and water quality protection and disposal of mill-site-generated solid wastes. Information is given on amortization, tax relief, and financing of pollution-abatement equipment and facilities. In 1973, $401 million were spent in operating, fixed, administrative, and research costs for environmental protection. On a 1973 production basis, these costs exceeded $6 per ton of paper and paperboard manufactured, which is ca. 50% more than was spent in 1972. (Witt-IPC)
W75-01380

FIVE-DAY BOD GENERATED DURING BLEACHING OF PULP IN THE GEMER PULP AND PAPER MILL (MNOZSTVO BSK(5) PRI BIELENI PAPIERENSKEJ BUNICINY V GEMERSKEJ CELULOZKE A PAPIERNI),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W75-01381

GROUNDWATER RECHARGE AND QUALITY TRANSFORMATIONS DURING THE INITIATION AND MANAGEMENT OF A NEW STABILIZATION LAGOON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
G. G. Small.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 494, $4.75 in paper copy, $2.25 in mirofiche. Master's Thesis, 1973. 78 p, 12 fig, 7 tab, 34 ref. OWRT-A-025-ARIZ(4). 14-31-0001-3503.

Descriptors: *Oxidation lagoons, *Groundwater recharge, Pathogenic bacteria, Coliforms, *Waste water treatment, Water purification, *Nitrates, Groundwater, *Seepage, *Computer models, Sewage, *Arizona, Path of pollutants, Water quality.
Identifiers: *Tucson(Ariz), Santa Cruz River(Ariz), Pima County(Ariz).

The objectives of an investigation at a new stabilization lagoon near Tucson, Arizona were (1) to estimate seepage losses; (2) to monitor the subsurface movement of seepage water and associated quality transformations; and (3) to compare the field data on nitrogen transformations with parallel data from a predictive computer model. Raw sewage was metered into the newly constructed lagoon. Seepage losses were calculated from data on inflow, evaporation, and change in storage of the lagoon. Water samples were obtained from depths of 40, 60 and 100 ft below the surface of the lagoon. The native groundwater table is 70 ft below the land surface in this area. Surface and subsurface water samples were examined for coliform organisms, plus various physical and chemical constituents. Estimated seepage rates from the lagoon ranged from 0.40 ft/day to 0.03 ft/day. A computer model was tested using the nitrate values obtained from the collected water samples. The model assumed that flow was entirely in the vertical direction and that the flow environment was aerobic. The actual nitrate values at 60 ft and values computed from the model were compared at the beginning of the inundation and after 69 days, with the results closely corresponding. No apparent undesirable effects occurred from seepage on the groundwater quality.
W75-01387

REJECTION OF WASTE HEAT FROM POWER PLANTS THROUGH PHASED-COOLING,
Auburn Univ., Ala. Dept. of Mechanical Engineering.
J. A. MacFarlane.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 674, $3.75 in paper copy, $2.25 in microfiche. (August 1973). 32 p, 7 fig, 21 ref. OWRR A-031-ALA(1).

Descriptors: *Thermal pollution, *Water cooling, *Electric powerplants, Heat transfer, *Waste water treatment, Model studies, Dispersion.
Identifiers: Phased-cooling, Cooling ponds.

Because of the disadvantages associated with present power plant cooling systems, a new concept in waste heat dissipation, called 'phased-cooling', is introduced. Heated condenser cooling water is held in a storage pond during certain hours of the day, to be cooled at a later time by traveling across a cooling surface. A thermodynamic analysis of the system is performed, and the equations of heat transfer from a water surface are presented. The developed model is then used for prediction of system performance. The optimum number of storage hours is shown to be dependent upon the size of the system, the season, and meteorological conditions. Phased-cooling evaporation losses are approximately 40 percent less than those of cooling towers and cooling ponds. Condenser inlet temperatures are significantly lower than those of cooling ponds of similar size.
W75-01391

WATER TREATMENT SLUDGE FILTRATION STUDIES,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. C. Hawkins.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 680, $4.75 in paper copy, $2.25 in microfiche. M. S. Thesis, Auburn University, December 1972. 97 p, 8 fig, 21 tab. OWRT A-024-ALA(2).

Descriptors: *Water treatment, *Sludge treatment, *Filtration, Coagulation, *Recycling, *Waste water treatment, Sulfates.
Identifiers: Alum sludge, Lime softening sludge, Aluminum sulfate.

An experimental investigation of various aspects of aluminum sulfate sludge and lime softening sludge filtration was conducted using specific resistance for filterability comparisons. The effects of solids concentration, aluminum sulfate coagulant dosage, and recycle of preformed sludge on the filterability of alum sludges were examined. The effect of varying calcium and magnesium hardness on the filterability of lime softening sludge was also investigated. Specific resistance of aluminum sulfate sludge was found to vary with increasing solids concentration. Low solids concentrations produced a decrease in specific resistance and higher values of solids concentration resulted in relatively constant values of specific resistance. It was also determined that the minimum specific resistance corresponded closely to the optimum aluminum sulfate dosage determined by jar test data. Colloidal restabilization was also observed as a decrease in specific resistance at higher alum dosages. Recycle of preformed sludge to a Bentonite suspension produced a decrease in specific resistance of the sludge formed upon coagulation of the suspension. Five recycles were conducted for each of the four turbidities. Increasing calcium hardness in a labortory prepared hard water was found to cause no significant change in the filterability of the lime softening sludge, whereas increasing magnesium hardness caused a significant increase in specific resistance.
W75-01392

TREATABILITY STUDIES OF TEXTILE-DOMESTIC WASTE MIXTURES IN A COMPLETELY-MIXED BENCH REACTOR,
Auburn Univ., Ala. Dept. of Civil Engineering.
R. A. Edwards.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 703, $5.25 in paper copy, $2.25 in microfiche. MS Thesis, August 1972. 107 p, 24 fig, 5 tab. OWRT A-034-ALA(1).

Descriptors: *Textiles, *Domestic Wastes, *Waste water treatment, *Industrial wastes, Mixing, Recycling, Storage, Sphaerotilus, Settling velocity, Biochemical oxygen, Chemical oxygen demand, Kinetics, Microorganisms.
Identifiers: *Mixed bench reactor, Combined treatment, Mixture ratios, Thiothrix.

An experimental investigation was conducted to determine qualitative and quantitative treatability information on highly alkaline mixtures of textile and domestic waste without pH adjustment. Mixture ratios, detention time, and rate of solids recycle were the variable parameters employed. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) were reduced significantly for various mixture ratios ranging from 10 percent textile - 90 percent domestic to 50 percent textile - 50 percent domestic for all detention times in excess of three hours. Settling characteristics of the biological solids were good for nine of the ten waste mixtures tested. The one waste mixture that produced poor settling biological solids contained a high concentration of sulfur dye waste. Microscopic examination of the poor settling biological solids revealed a high concentration of filamentous microorganisms. These were identified to be Sphaerotilus and Thiothrix, and it was thought that their presence in high concentration was the cause of poor settlability. The kinetic coefficients were determined for three textile-domestic waste mixtures which employed textile waste from a single uniform batch. The maximum specific growth rate did not vary significantly for changes in textile-domestic waste mixture ratios within a given textile batch. In general the saturation constant, yield coefficient, and decay constant, were found to increase as percentages of textile waste in the mixture increased.
W75-01393

ECONOMICS OF WASTEWATER TREATMENT: THE ROLE OF REGRESSION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 700, $3.25 in paper copy, $2.25 in microfiche. 1973. 15 p, 1 tab, 12 ref. OWRT A-024-IND(5).

Descriptors: *Waste water treatment, *Regression analysis, *Decision making, Wages, Electric power costs, Construction costs, *Operating costs, Activated sludge.
Identifiers: *Cost functions, Total cost.

This paper presents some initial work on developing operating cost functions for activated sludge waste treatment plants in a framework allied to developments in the field of economics. Section I details some specific alternative functional forms which might be employed, noting some of the specific implications and restrictions of each. Section II presents initial cost estimation results using data provided by the Indiana State Board of Health. The last section is devoted to a consideration of the use of such results for policy decision-making noting what information is provided by such results, what limitations regression estimation results possess in general, and what alternative methods may be used to provide the details necessary for policy planning decisions. (Wiersma-Purdue)
W75-01405

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT LEVELS ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics.
L. D. Airan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 684, $5.25 in paper copy, $2.25 in microfiche. MA Thesis, 1973. 93 p, 10 fig, 8 tab, ref, 4 append. OWRR B-054-NC(2).

Descriptors: *Waste assimilative capacity, *Water quality control, *Systems analysis, Waste treatment, *Optimization, Economics, Mathematical models, *Computer models, *Dissolved oxygen, *Waste water treatment, *North Carolina, Water quality standards, Costs.
Identifiers: Neuse River(NC).

A mathematical programming model is developed for minimizing waste treatment costs to achieve a given stream standard for dissolved oxygen. A least cost set of treatment levels is calculated using available information about the costs of waste treatment and the effects of waste in different reaches with an assumed procedure for bargaining among waste dischargers. Each discharger is assumed to be responsible for the quality of water in his reach. The solution suggests a least cost set of discharge permits and charges. However, it does not favor any one administrative system or distribution of costs. The model is run to find optimum least cost waste treatment levels for the Neuse River of North Carolina. The optimum solution has less treatment than is currently being used. The costs of present waste treatment are estimated to be $3.7 million per year while the cost of the least cost set of treatment levels is only $1.09 million. (McJunkin-North Carolina State)
W75-01407

WATER QUALITY CONTROL: NONLINEAR PROGRAMMING ALGORITHMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W75-01410

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
H. McMillan.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 376-382. 1 fig.

Descriptors: *Water resources development, *Planning, *Administrative agencies, Management, Waste disposal, Sludge disposal, Land reclamation, History, *Illinois, Facilities, Treatment facilities, *Waste water treatment.
Identifiers: *Chicago(Ill).

The history, present status, and future plans of the Metropolitan Sanitary District of Greater Chicago are presented. Prior to 1900, sanitary waste disposal from Chicago was accomplished by discharging the wastes into natural river systems which ultimately discharged into Lake Michigan. The initial effort of the Sanitary District was the construction of 3 channels to reverse the flow of the natural waterways, taking the wastes away from the Lake Michigan Basin and introducing them into the Illinois River via the Des Plaines River. Today the District owns and operates seven sewage treatment plants that provide secondary treatment for 5.5 million people and an industrial load population equivalent to 4.5 million. The District operates and maintains some 81 miles of navigable waterways; maintains some 100 miles of streams; monitors industrial plant discharges; enforces sewer, waste, and industrial discharge ordinances; maintains and operates interceptor systems; designs and oversees construction and rehabilitation of facilities; and inspects construction and maintenance of local sewer systems. Solids generated in wastewater treatment processes are applied as liquid fertilizer to strip mine areas for land reclamation. (See also W75-01428) (Humphreys-ISWS
W75-01465

SEA PROTECTION AGAINST CONTAMINATION WITH OIL-CONTAINING WASTE WATER,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
M. V. Gasanov, R. G. Mamedov, and G. B. Babaev.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 383-390. 1 tab, 4 ref.

Descriptors: *Environment, *Water pollution treatment, *Water pollution sources, *Oil wastes, Organic wastes, Domestic wastes, Biodegradation, Oily water, *Waste water treatment, Seashores, Coasts, Chemical degradation, Oceans.
Identifiers: *Caspian Sea, USSR.

Waters from oil fields introduced contamination into the Caspian Sea when prospecting, drilling, and transporting oil. Results of investigations using mechanical and biochemical waste water treatment showed that a mixture of oil sewage from oil production and domestic wastes can be successfully treated. The mixture to be treated contained 50% industrial waste and 50% domestic waste. Total BOD up to 250 mg/1 for domestic waste and oil products waste up to a total BOD of 45 mg/1 were recommended. The oxidation activity of microorganisms in an aeration tank was not restrained. The treatment process reduced total BOD to 5-7 mg/1, organics to 10 mg/1, and suspended material to a maximum of 15 mg/1. Waters with this quality are used for preservation of sea coast zones from oil organics. (See also W75-01428) (Humphreys-ISWS)
W75-01466

THE METHOD OF REDUCTION OF SEWAGE DISCHARGE INTO THE SEA,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
A. D. Kengerli, A. M. Agalarov, and Yu. F. Libnyakova.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 391-399. 2 fig, 5 ref.

Descriptors: *Environment, *Water pollution control, *Scaling, *Waste water treatment, Corrosion, Recirculated water, Water reuse, Oceans, Carbonates, Water circulation, Reclaimed water.
Identifiers: Electromagnetic water treatment.

One of the methods of reduction of high-mineralized sewage discharge into the sea is repeated sewage utilization in recirculating water supply systems. In practice, the formation of carbonate deposition on the surface of technological equipment limits use of this method. Thus in circulating water supply systems utilizing water of the Caspian Sea, scale-formation up to 2-3 mm/year occurs. Stabilizing action of some phosphatic compounds, inhibited acids, and electromagnetic water treatment was established by experimental investigations. The investigations, carried out in mineralized water with treated sewage used as an additive, showed that oil organics with concentrations of 30-40 mg/1 in water noticeably decreased bicarbonates disintegration and reduced scale crystals growth. For total stabilization of these waters, it was recommended that the water be treated by the method of acidification or with an electromagnetic field. Efficiency of methods for preventing scale formation was 85-90%. (See also W75-01428) (Humphreys-ISWS)
W75-01467

AQUA-SANS SEWAGE TREATMENT SYSTEM,
Chrysler Corp., New Orleans, La. Space Div.
R. W. Fullerton.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 443-449. 1 fig, 3 tab.

Descriptors: *Environment, *Waste water treatment, *Sewage treatment, Research and development, Separation techniques, Recycling, Waste disposal, Pollution abatement, Control, Sewage disposal, Burning.
Identifiers: *Aqua-Sans, Disposal system, Closed loop, Human wastes.

Aqua-Sans, the closed loop no-discharge nonbiological sewage disposal system, uses mineral oil as the flush fluid to transport human waste instead of water. The flushing fluid carries waste from conventional commodes to a separation tank where the sewage is separated by gravity. The fluid is filtered, purified, and reused indefinitely. Disposal is by burning in a pollution-free incinerator. (See also W75-01428) (Humphreys-ISWS)
W75-01471

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION: OBJECTIVE, ORGANIZATION AND EXTENT OF PROGRAM, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 5G.
W75-01599

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION:

SURFACE WATER QUALITY OF RECIPIENTS, AUGUST-OCTOBER, 1972, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 5G.
W75-01600

COMPACT WASTE WATER PUMPING SYSTEMS WITH HIGH CAPACITY (KOMPAKTE ABWASSERPUMPWERKE GROSSER LEISTUNG),
Haeny und Cie, Meilen (Switzerland).
H. Jaggi.
Schweizerische Bauseriung, Vol 92, No 22, p 541-544, 1974. 5 fig, 1 ref.

Descriptors: *Waste water treatment, *Pumps, *Cooling systems, Equipment, Treatment facilities.
Identifiers: Air cooling, Oil cooling.

Compact waste water pumps with high capacity are described with special regard to cooling systems. In pump shafts with no flooding hazards, vertical or horizontal assemblies with a short drive shaft and conventional electric engines are used. However, it is also possible to use compact comonobloc systems incorporating splash-proof submerged pumps that should be provided with efficient cooling systems. Air cooling is not feasible due to the limited space of the collection shaft. Effective cooling can be achieved by the use of oil-filled electric motors with oil cooling in a separate cooler cooled by waste water. Such pumps are available for capacities up to 150 kWatts. (Takacs-FIRL)
W75-01628

DRAIN CONSTRUCTION UNDER HIGH GROUNDWATER LEVEL CONDITIONS (O STROITEL 'STVE DRENAZHA V USLOVIYAKH VYSOKOGO URONNYA GRUNTOVYKH VOD),
For primary bibliographic entry see Field 8A.
W75-01629

INVESTIGATION OF THE OPTIMAL LIFE OF FIXED CAPITAL IN WATER SUPPLY AND SEWER SYSTEMS (AZ ALLOESZKOZOK OPTIMALIS ELETTARTAMANAK VIZSGALATA A VIZELLATAS ES CSATORNAZAS TERULETEN),
For primary bibliographic entry see Field 8A.
W75-01630

DESIGN OF A COMBINED SEWER OVERFLOW REGULATOR CONCENTRATOR,
National Environmental Research Center, Edison, N.J. Edison Water Quality Research Div.
R. Field.
Journal Water Pollution Control Federation, Vol 46, No 7, p 1722-1741, July, 1974. 24 fig, 2 tab, 15 ref.

Descriptors: *Combined sewers, *Design criteria, *Hydraulic design, Sewer systems, Treatment facilities, Water pollution control.
Identifiers: Dry weather flow, Settleable solids.

A new type of combined sewer overflow regulator/concentrator was developed; the swirl unit which resulted offers potential control of both quantity and quality of overflows. Mechanical breakdown and power requirements and corrosion complications are eliminated to a great extent, and detention times are very short. It is simple to design, but requires evaluation of the following factors: hydraulic head differential between the collector and interceptor sewers, hydraulic capacity of collector sewer, design flow, dry weather flow and capacity of interceptor sewer, and amount and character of settleable solids. (Murphy-FIRL)
W75-01631

SEWAGE AND EFFLUENT TREATING SYSTEM,
R. P. Briltz.
Canadian Patent 951,035. Applied July 6, 1971. Issued July 9, 1974. Patent Office Record, Vol 102, No 28, p 96-97, July 1974.

Descriptors: *Patents, *Effluents, *Sewage treatment, Pumping, Flocculation, Conduits, Canada, *Waste water treatment.

A patent was issued for a sewage and effluent treatment system. Effluent is pumped from the primary sewage treatment location through an agitating module at which time a flocculating agent is introduced into the sewage. This module includes a casing, an intake header at one end, an outlet baffle chamber at the other end, and a plurality of conduits extending between the header and chamber. The sewage and flocculent are agitated and thoroughly mixed in this flocculent module, and the majority of the flocculated material is separated out by baffles. The deflocculated effluent then passes to conventional first and second stage filtering tanks. Means are provided to back flow the modules to remove the flocculated material and cleanse the modules when necessary. (Murphy-FIRL)
W75-01632

CLARIFYING TANK FOR EFFLUENTS.
German Patent DS 1658-054. Applied May 10, 1967. Issued May 16, 1974. German Patent Abstracts, Vol 5, No 21, p 1, June 28, 1974.

Descriptors: *Patents, *Clarification, *Tanks, *Effluents, Flocculation, Filters, Equipment.

A patent has been issued for clarifying tank for effluents which consists of a flocculation space, surrounded by a ring on which rests the vessels containing the flocculant fluid bed and the solid filter. This supporting ring has passages, and covers a flushing trough. Flushing holes join the latter to the passages to keep them clean. An external girder ring supports the ring. (Murphy-FIRL)
W75-01634

PRECIPITATING AGENT FOR WATER PURIFICATION PROCESSES, AND A METHOD OF PREPARING SAME,
Aktiebolaget Gullhogens Bruk, Skovde (Sweden). (assignee)
For primary bibliographic entry see Field 5F.
W75-01635

STRAINER DEVICE FOR LIQUIDS,
H. P. LeBlanc.
United States Patent 3,823,831. Applied November 19, 1971. Issued July 16, 1974. Official Gazette of the United States Patent Office, Vol 924, No 3, p 545, July, 1974. 1 fig.

Descriptors: *Patents, *Liquids, *Solids, *Separation, *Strainers, Equipment, Flow, *Waste water treatment.
Identifiers: *Backflushing.

An invention for straining has been patented. It relates to an in-line strainer without interrupting the fluid flow, meanwhile allowing backflushing. The strainer device comprises a ball-shaped strainer element rotably mounted within a strainer body, the strainer element being provided with an inlet into which the debris containinig fluid is directed. The debris is continuously collected within the ball-shaped strainer element. Screen closure means are provided within the strainer element whereby its inlet can be closed off to retain the debris within the strainer element which is back flushed by rotation. During rotation the fluid stream is continued to be strained. Clean out means are provided in conjunction with the ball-shaped strainer element whereby the debris can be collected in a sump reservoir, after which the ball-shaped strainer elements is returned to its normal straining position. (Murphy-FIRL)
W75-01637

EXAMPLES OF THE EFFECTIVE USE OF PLASTIC MATERIALS IN A MUNICIPAL WATER SUPPLY AND WASTE WATER TREATMENT PLANT (BEISPIELE DER EFFEKTIVEN PLASTANWENDUNG IN EINEM VEB WASSERVERSORGUND UND ABWASSERBEHANDLUNG),
VEB Wasserversorgund und Abwasserbehandlung, Magdeburg (East Germany).
D. Koehler.
Wasserwirtschaft-Wassertechnik, Vol 24, No 3, p 95-98, 1974. 4 fig.

Descriptors: *Plastics, *Municipal water, *Water supply, *Waste water treatment, Materials, Percolation, Pipes, Construction materials, Plastic pipes, Treatment facilities.
Identifiers: PVC pipes, Germany.

Examplex of the various uses of plastic materials in municipal water supply and waste water treatment in East Germany are presented. Compared with conventional materials, plastics excel by their long useful life, reduced production and maintenance costs, light weight, and increased resistance to physical and chemical effects. Venthole covers, instrument cabinets, waste water pipes, sludge manifolds, for sludge drying rows, percolation bodies for waste water treatment, and insulating layers are made of PVC, while polyethylene is used for coating tanks and pipes. Epoxy resin as filler is used for the repair of pump blades damaged by cavitation, of surfaces exposed to wear, and of concrete pipes, as well as for coating tanks. Polyester resin is used as construction material for tanks, and for the repair of broken pipes. (Takacs-FIRL)
W75-01638

THE PLATEAU B.O.D.--MEASUREMENT AND SIGNIFICANCE (DER PLATEAU-BSB-MESSUNG UND AUSSAGEKRAFT),
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 5A.
W75-01640

FILTERING AND CONCENTRATING MEANS AND METHOD,
E. W. Smith.
Canadian Patent 950,837, Applied December 23, 1970, Issued July 9, 1974, Patent Office Record, Vol 102, No 28, July, 1974.

Descriptors: *Filters, *Patents, Slurries, Equipment, Particles, Screens, *Waste water treatment.
Identifiers: Oscillation.

An apparatus for filtering and concentrating liquid slurries is provided and consists of a container with an encircling filter screen mounted about an axis. Means are provided for torsionally oscillating the screen with respect to the container; thus, liquid is removed from a liquid particle mass in the container after it passes through the screen. The particles remain in the mass with little or no tendency to clog the screen. (Prague-FIRL)
W75-01650

5E. Ultimate Disposal Of Wastes

USE OF SEWAGE WASTEWATER AND SLUDGE IN REVEGETATING STRIP MINE SPOIL BANKS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
L. T. Kardos, W. E. Sopper, J. A. Dickerson, and C. F. Hunt.
In: Proceedings, 32nd Annual Conference of the Chemurgic Council, Washington, D.C., October

22-23, 1970, p 17-28, 8 tab, 5 ref, (Pennsylvania Institute for Research on Land and Water Resources, Miscellaneous Technical Report, Oct, 1970).

Descriptors: *Sewage effluents, *Sewage disposal, *Sludge disposal, *Irrigation, *Strip mine wastes, Revegetation, Trees, Grasses, Legumes, Hydrogen ion concentration, Temperature, Soil moisture, Pennsylvania, Nitrogen, Phosphorus, Toxicity, Salts.
Identifiers: Strip mine spoil banks, Toxic chemicals.

Successful establishment of trees, grasses and legumes was accomplished on extremely acid strip mine spoil by irrigation with sewage effluent and/or liquid digested sludge. The best results were obtained at an application rate of 2 inches of effluent plus 2 inches of sludge per week. The sludge contributed to the chemical detoxification of the spoil. Percolate obtained from rains during the month prior to the start of irrigation ranged between 2.2 and 2.8. However, an average pH of 4.06 was obtained after the 2 inch effluent plus 2 inch sludge application. The water in both effluent and sludge applied in irrigation at weekly intervals leached. Toxic chemicals out of the root bed diluted the concentration of salts, cooled the surface of the spoil by direct heat transfer to the water, provided water for evaporational cooling, and provided soluble nutrients such as phosphorus and nitrogen. Soil moisture and surface temperatures were monitored. Control surface temperatures averaged 9F higher than the irrigated treatments. The fertilizer equivalent of effluent and sludge treatments was presented in tabular form.
W75-01237

PROBLEMS OF LIQUID WASTE DISPOSAL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-01252

EFFECTS OF EFFLUENTS OF THE ASTRAKHAN PULP AND BOARD MILL ON SOIL PROPERTIES (VLIYANIE STOCHNYKH VOD ASTRAKHANS-KOGO TSELLYULOZNO-KARTONNOGO KOMBINATA NA SVOISTVA POCHV),
For primary bibliographic entry see Field 5B.
W75-01257

EXPERIENCES WITH DEWATERING OF SLUDGES FROM A PURIFICATION PLANT FOR CHEMICAL INDUSTRY EFFLUENT,
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W75-01267

HOW REALISTIC IS FODDER YEAST PRODUCTION FROM WOOD INDUSTRY WASTE PRODUCTS. (HUR REALISERA FODERJASTTILLVERKNING PO SKOGSINDUSTRIELLA AVFALLSPRODUKTER.),
Svenska Traforskningsinstitutet, Stockholm.
For primary bibliographic entry see Field 5D.
W75-01278

USE OF DRIED SLUDGE FROM PAPER PROCESSING WASTES IN TROUT DIETS,
Bureau Sport Fisheries and Wildlife, Spearfish, S.D. Diet Testing Development Center.
For primary bibliographic entry see Field 5C.
W75-01283

ACTIVATED CARBON FROM BARK FOR EFFLUENT TREATMENT,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-01284

ARTIFICIAL LIGHT-WEIGHT AGGREGATE FROM WASTE MUD OF SILICA SAND FACTORIES AND WASTE FLUID OF PULP FACTORY,
Nagoya Inst. of Tech. (Japan). Materials Research Lab.
For primary bibliographic entry see Field 8F.
W75-01372

DISPOSING OF INDUSTRIAL WASTES: THE PAPER INDUSTRY (SMALTIMENTO RIFIUTI INDUSTRIALI: INDUSTRIA DELLA CARTA),
Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy).
For primary bibliographic entry see Field 5D.
W75-01379

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-01465

THE METHOD OF REDUCTION OF SEWAGE DISCHARGE INTO THE SEA,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
For primary bibliographic entry see Field 5D.
W75-01467

5F. Water Treatment and Quality Alteration

RELATIONSHIPS BETWEEN THE FLUORIDE AND MAGNESIUM CONCENTRATIONS IN DRINKING WATER AND SOME COMPONENTS IN SERUM RELATED TO CARDIOVASCULAR DISEASES IN MEN FROM FOUR RURAL DISTRICTS IN FINLAND,
Helsinki Univ. (Finland). Dept. of Dentistry.
For primary bibliographic entry see Field 5C.
W75-01133

WATER AND SEWER PLAN FOR CALHOUN, DEWITT, GOLIAD, JACKSON AND VICTORIA COUNTIES.
Golden Crescent Council of Governments, Victoria, Tex.
For primary bibliographic entry see Field 5C.
W75-01136

WATER STILL,
O. L. Powers.
U S Patent No 3,838,016, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 926, No 4, p 1392, September 24, 1974.

Descriptors: *Patents, *Distillation, *Condensation, *Water treatment, Water purification.

A water still apparatus for producing distilled water is provided having the heating element for generating steam from water in a container and a condenser for condensing the steam into distilled water. The still has cascading baffles for water entering the still to pass over and for the steam to pass through, thereby preheating the entering water and removing heat from the steam. The still is automatically operated by utilizing a pair of floats for controlling the input of water and to cut off the still when the distilled water container is filled. The steam is prevented from escaping from the water inlet by having an overflow pipe feeding to below a water level on the next level of the input water path. A fan for cooling the condenser along with a heating element for maintaining the distilled water sterile are also provided as is means for making the still operate to humidify the surrounding air if desired. (Sinha-OEIS)
W75-01185

PROCESS FOR REMOVAL OF ALGAE, DIATOMS AND ORGANIC CONTAMINANTS FROM WATER,
For primary bibliographic entry see Field 5D.
W75-01191

PILOT PLANT EVALUATION OF WATER TREATMENT BY DIRECT FILTRATION,
Metropolitan Water Sewerage and Drainage Board, Sydney (Australia). Design Branch.
K. A. Waterhouse.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 75-81, 1974. 10 fig, 5 tab, 2 ref.

Descriptors: *Water treatment, *Filtration, *Treatment facilities, Coagulation, Chemical precipitation, Water purification, Filters, Sands, Turbidity, Water quality, *Pilot plants.
Identifiers: Nepean Dam(N.S.W.), Alum treatment, Anthracite-sand filters.

A pilot plant was established to test the possibility of using a 'filtration only' process with minimum coagulant addition and without flocculation or sedimentation for treating water from a dam supplying four New South Wales towns. The problem is generally one of color and iron content, with the incidence of relatively high turbidity restricted to periods directly after heavy rain in the catchment area. The pilot tests established: that a filtration rate of 4.1 mm/s gave a satisfactory result under the conditions of the tests; that the dosage of alum coagulant was critical, with definite optima affected by the level of turbidity; that a dual anthracite-sand filtration medium gave markedly better results in terms of length of filter run than a simple sand filter; and that a minimum detention time is required between addition of the alum and entry of the water into the filter medium. Multiple injection points should be provided in the design so that detention time can be adjusted to take account of the rate of flow and water quality. (CSIRO)
W75-01251

WATER TREATMENT SLUDGE FILTRATION STUDIES,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-01392

EFFECT OF MIXED-GRASS AND NATIVE-SOIL FILTER ON URBAN RUNOFF QUALITY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
B. P. Popkin.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 683, $5.25 in paper copy, $2.25 in microfiche. Masters Thesis, 1973. 112 p, 2 fig, 6 tab, 67 ref, 6 append. OWRR B-023-ARIZ(2). 14-31-0001-3556.

Descriptors: *Soil filters, *Water treatment, *Water quality control, *Storm runoff, *Filtration, *Urban runoff, Soil-water-plant relationships, Flood control, Chemical oxygen demand, Suspended solids, Turbidity, Coliforms, Leaching, Infiltration, Chlorination, Recreation, Irrigation, Artificial recharge, Fisheries, Wildlife, Arid land, *Arizona.
Identifiers: *Tucson(Ariz).

A grass-covered soil filter of native calcareous loam, 200-feet long, 4-feet wide and 5-feet deep, was tested for effectiveness as a water-quality treatment for Tucson urban storm runoff. Water was pumped from Arcadia Wash and applied to

the filter in four trials in Fall 1971. Inflow and outflow volumes were measured, sampled and analyzed for important water-quality variables. For grass and grass-soil filtration respectively, the following maximum percent reductions, compared to untreated runoff, occurred: For chemical oxygen demand (COD), 19 and 88; for suspended solids, 34 and 99.6; for volatile suspended solids, 26 and 97; for turbidity, 97 and 98; for total coliforms, 84 and 98; and for fecal coliforms, 50 and 98. Grass-soil filtration, during the four trials, produced water too saline for most uses. After the initial stabilization period, grass-soil filtration was more effective than grass filtration in water-quality improvement. Grass-soil filtration had, with time, increasing COD and salt concentrations in the early part of each trial, and decreasing infiltration rates. Grass maturity and soil compaction, following construction of the filter, initially increased efficiency of the water-quality improvement process. Grass filtration upgraded cool-season urban runoff for recreation, irrigation, artificial groundwater recharge, fisheries and wildlife, except in the initial part of some trials and in the grass-establishment period when COD, volatile suspended solids and coliforms increased. Chlorination of treated runoff is necessary, particularly for warm-season flows, when recreational water use is anticipated.
W75-01395

A BIOASSAY OF TOXICITY USING PROTOZOA IN THE STUDY OF AQUATIC ENVIRONMENT POLLUTION AND ITS PREVENTION,
Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena.
For primary bibliographic entry see Field 5C.
W75-01604

PRECIPITATING AGENT FOR WATER PURIFICATION PROCESSES, AND A METHOD OF PREPARING SAME,
Aktiebolaget Gullhogens Bruk, Skovde (Sweden). (assignee)
K. G. K. Kawert.
United States Patent 3,827,984. Applied June 1, 1972. Issued August 6, 1974. Official Gazette of the United States Patent Office, Vol 925, No 1, p 240-241, August, 1974. 1 fig.

Descriptors: *Patents, *Water purification, *Potable water, Metals, Solubility, *Chemical precipitation, Water treatment, *Waste water treatment.
Identifiers: Minerals.

An agent for purification of water by precipitation, and a method for preparing this precipitating agent has been patented. The water is purified to such an extent that raw water becomes potable and suitable for cooking and food preparing, and sewage must be cleaned so that it can be released into receiving waters with no deleterious effects. The substances to be removed are primarily iron, manganese, aluminum and various phosphates, but the water may also contain copper, lead and mercury. The precipitating agent comprises a mixture of minerals which, after a previous burning, have different solubility products. The mixture has a mole ratio of 1.0-5.0 between basic and acid oxides, and a content of 5-40 percent Si02, 5-15 percent A1203 3-12 percent Fe203, 15-70 percent Ca0 and O.1-20 percent Mg0 in an ignited sample. In the preparation of the precipitating agent sufficient mineral formation is obtained, and the burnt mixture contains minerals of different solubility products having a mole ratio between basic and acid oxides of 1.0-5.0 and the above-mentioned analysis data. The product is subsequently ground to a powder having a fineness of 10-20 percent by weight greater than 60 micrometers and 0-2 percent by weight greater than 90 micrometers. (Murphy-FIRL)
W75-01635

CLEAR-SPAN DOMES COVER WATER TANKS.
For primary bibliographic entry see Field 5G.
W75-01639

5G. Water Quality Control

INFLUENCE OF SEVERAL ALGAE ON 2,4-D RESIDUES IN WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Department of Plant Pathology and Physiology.
J. P. Valentine, and S. W. Bingham.
Weed Science, Vol 22, No 4, p 358-363, July 1974. OWRT A-033-VA(5).

Descriptors: *2-4-D, Euglena, Chlamydomonas, Runoff, *Herbicides, *Algae, Metabolism, *Scenedesmus, Water pollution effects, *Nutrient removal, Absorption, *Pesticide residues, Water pollution control.
Identifiers: Scenedesmus quadricauda(Turp) Breb.

Removal of (2-14C), 2,4-D((2,4-dichlorophenoxy) acetic acid) from water was pronounced with Scenedesmus quadricauda (Turp.) Breb. and most effective uptake occurred at pH 4.7. Three other algae were relatively ineffective in removal of 2,4-D. Increasing Scenedesmus cell density increased 2,4-D removal, but the amount absorbed was not a linear function of cell density. Similarly, with a range of herbicide concentrations (0.01 to 1.0 ppmw) the amount removed was greatest at the highest concentration; however, a higher percentage of chemical was removed at lower concentrations. An equilibrium of 14C removal from water and 14C released to the water was reached by 4 hr. More herbicide was removed from water by Scenedesmus in darkness than in light and low temperature (2 C) reduced uptake slightly. Relatively high 2,4-D concentrations were required to reduce growth in any of the four algae and Scenedesmus was most sensitive. Scenedesmus metabolized (ring-14C) in 24 hr to several products which were found in suspension fluid and cells. Quantitatively, 3-OH-2,4-D ((3-hydroxy-2,4-dichlorophenoxy) acetic acid) was the major metabolite, comprising 26% of the radioactivity extracted from cells compared to 15% from suspension fluid. A smaller amount of 5-OH-2,4-D ((5-hydroxy-2,4-dichlorophenoxy) acetic acid) was isolated from the suspension fluid and none from the cells.
W75-01108

GROUNDWATER MANAGEMENT AND SALINITY CONTROL,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 4B.
W75-01117

THE OXYGEN SAG EQUATION: NEW PROPERTIES AND A LINEAR EQUATION FOR THE CRITICAL DEFICIT,
International Business Machines Corp., Gaithersburg.
For primary bibliographic entry see Field 5A.
W75-01118

INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBAN BASINS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-01124

ORGANIZATIONAL EVALUATION OF INDUSTRIAL WATER POLLUTION CONTROL IN THE NEW YORK REGION,
New York Univ., N.Y. Graduate School of Public Administration.
R. Zimmerman.
Water Resources Bulletin, Vol 9, No 6, p 1210-1224, 1973. 2 fig, 7 tab, 16 ref. OWRT C-1629(No 3147)(8).

Descriptors: *Pollution abatement, *Industries, *Legislation, Water pollution control, Institutions, Scheduling, Social aspects, Political aspects, Evaluation, New York, New Jersey, Connecticut, Motivation.
Identifiers: *Effective compliance, Abatement orders, *New York City Regional area.

The impact of a number of nontechnical factors relating to an organization's behavior and characteristics is explored. The interaction of state pollution control agencies and industries in the 21 county, three-state New York region provide the study's data base. The region presently contains 15% of all manufacturing establishments in the country and generates between 0.6 and 2.7 million pounds per day of BOD material and an unidentified level of solids and metals. A transitional matrix is first produced to illustrate the overall abatement effectiveness in the 1967-1971 period. Numerical distribution of firms at various abatement stages is presented. A survey of 175 firms concluded that over one-half of their programs have been ineffective. The compliance of 209 firms to state abatement orders in the region is next evaluated. The impact of other state policies and programs is also discussed. Two variables--status of firm in the latest abatement schedule and action of the state to this status--are identified as indicators of compliance. The degree of compliance to abatement orders in the region was found positively related to organizational size, waste generation, community size, community wealth, and treatment facilities and is also related to the structure of the abatement schedule. (Schroeder-Wisconsin)
W75-01129

INFORMATION GENERATION AND COMMUNICATION TO ESTABLISH ENVIRONMENTAL QUALITY OBJECTIVES,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 6G.
W75-01130

EFFLUENT CHARGES, INFORMATION GENERATION AND BARGAINING BEHAVIOR,
British Columbia Univ., Vancouver. Westwater Research Centre.
A. H. J. Dorcey.
Natural Resources Journal, Vol 13, No 1, p 118-133, January 1973. 2 fig, 4 tab, 16 ref. OWRT C-1228(No 1601)(11) and B-038-WIS(6). 14-01-001-1601 and 14-31-001-3352.

Descriptors: *Economic efficiency, *Pollution control, *Water quality control, *Pollution abatement, *Pollution taxes(Charges), Economic feasibility, Taxes, Water pollution abatement, Water pollution control, Water quality, Water pollution, Water pollution sources, Costs, Benefits, Economic evaluation, Evaluation, Effluents.

A pollution control strategy of effluent charges would involve a benefit-cost analysis to establish ambient water quality standards. A charge derived by a public agency, would be determined by an iterative process of raising the charge until water quality standards are met. An assessment of whether an effluent charge would produce expected improvements in water pollution control indicates that an effluent charge can be a highly inefficient means of achieving ambient water quality standards. The iterative process of implementation of the charge will result in a bargaining situation in

which polluters who have an interest in delaying and minimizing charges will have greater resources and more time to devote to bargaining. Thus the effluent charge strategy will not necessarily be more effective than the present strategy of regulation and enforcement. The study of the behavioral characteristics of pollution control indicate that a more effective strategy might include a management plan for efficient achievement of standards, cost sharing to increase political acceptability of such plans and structured bargaining among all affected parties. (Barnes-Florida)
W75-01131

I-90 LAKE WASHINGTON CIRCULATION STUDY.
Cornell, Howland, Hayes and Merryfield, Bellevue, Wash.
Washington State Highway Department, District No 7, Bellevue, Washington, April 1973. 48 p, 17 fig, 6 tab.

Descriptors: *Water circulation, *Tracking techniques, *Water pollution, *Bridges, *Limnology, *Storm runoff, Storm drains, Water pollution effects, Water quality control, On-site data collections, Washington, Highway effects, Dye dispersion, Dispersion, Path of pollutants, Outfall sewers, Outlets, Hydraulics, Flow areound objects.
Identifiers: *Lake Washington, *Floating bridge.

The I-90 Bridge Circulation Study of Lake Washington was composed of two tasks. The first task attempted to evaluate the circulation patterns and dispersion capabilities of the waters within the immediate vicinities of the existing and proposed I-90 bridge crossings. The second task was to recommend optimal discharge locations for three proposed storm water outfalls on Mercer Island. Lake Washington waters near the floating bridge were found to have a significant circulation system with a high dispersive capacity. This indicates that the central portion of the lake has a large potential for dilution of storm water runoff. It was recommended that point-source discharges from the proposed floating bridge be located at least 200 feet from shore in order to receive maximum dispersion. A proposed storm water discharge adjacent to the existing I-90 floating bridge on the west side of Mercer Island would receive maximum dispersion if discharged 200 feet from shore. The 76th Street outfall location presents several problems for storm water discharge. While adequate dilutions can be obtained over a 4-hour period from outfall locations greater than 300 feet offshore, the current patterns in the area may confine the effluent field to a relatively small area. This confinement could result in a build-up of effluent concentration adjacent to the shoreline. For adequate mass transport and dispersion of storm water discharge into the East Channel of Lake Washington, the location of a proposed stormwater outfall from Mercer Island should be approximately 300 feet from shore and not immediately adjacent to the bridge piers. (Poertner)
W75-01134

FREEWAY RUNOFF FROM THE I-90 CORRIDOR,
Municipality of Metropolitan Seattle, Wash.
For primary bibliographic entry see Field 5C.
W75-01135

CONTROL OF COMBINED SEWER OVERFLOW EVENTS,
Municipality of Metropolitan Seattle, Wash. Technical Services Dept.
T. W. Mallory, and C. P. Leiser.
Paper presented at the International Public Works Congress and Equipment Show, Denver, Colorado, September 15-20, 1973. 27 p, 9 fig, 6 tab, 13 ref.

Descriptors: *Combined sewers, *Water pollution control, *Sewers, *Automatic control, *Automation, Computers, Washington, Sounds, Oceans, Waste water disposal, Pollution abatement, Municipal waste, Urbanization, Cities.
Identifiers: *Combined sewer overflows, *Puget Sound.

Combined sewer overflow, once designed into systems in order to prevent sewerage back-up during peak periods, is an ever increasing source of pollution. Sewer separation as a solution has serious drawbacks due to the large capital investment required and because urban storm drainage itself can be a source of pollution for receiving waters. One promising solution is the construction of additional storage into the system or utilizing storage within the system. These storage systems will temporarily detain excess sewage flows for later release into the system for treatment. In January, 1971, Metropolitan Seattle placed into operation a monitoring and control facility termed CATAD, or 'Computer Augmented Treatment and Disposal' system. Central and remote stations encompass a wide area in and around Seattle. Most storage is in trunk lines upstream of mechanically-driven sluice gates located within regulator stations. The computer monitors data and makes multiple, rapid and complex decisions for the dozens of control points in the system. The overflow control system has many components. The heart of the system is a real-time, process control computer which converts the collected data from sensors and monitoring devices into a visual display at the central console. Colored lights on a wall map give visual indications to operators of the status of any active station within the system. (Poertner)
W75-01138

REGION 'P', PHASE I WATER QUALITY MANAGEMENT PLAN,
Neuse River Council of Governments, New bern, N.C.
L. R. Lichtblau.
June 1973. 186 p, 15 fig, 30 tab.

Descriptors: *Planning, *Water quality control, *Regional development, *Administration, *North Carolina, *Water resources development, Water pollution control, Water quality standards, Environmental control, Land use, Waste disposal, Long-term planning, Comprehensive planning, Regional analysis, Hydrology, Groundwater resources, Surface waters, Sewage treatment.

Water quality problems were studied in a nine-county region of eastern North Carolina, designated Region 'P'. These counties, several of which lie along the Atlantic Ocean, are Carteret, Pamlico, Onslow, Jones, Craven, Lenoir, Greene, Wayne and Duplin. Phase I of the study comprised the initial inventory of the water resources in Region 'P' including surface and groundwater hydrology, point and non-point source discharges and conditions of potential danger to public health and economic stability. These elements together with the information base established in the report were developed to put into perspective the operating base to assist local governments in resolving water quality problems. These initial efforts are to be refined in the subsequent Phase II and Phase III reports and used in the development of the final Water Quality Management Plan for Region 'P'. Region 'P' is abundantly endowed with a multitude of water resources capable of satisfying the present and future needs of the region. The quality of water in the region, both groundwater and surfacewater, are however beginning to show signs of deterioration. The following four problems have been identified as major factors contributing to the deterioration of the region's water resources: land use, waste discharges, cost, and time. To create a meaningful and effective water quality management plan, these problems must be resolved by local governments in a coordinated plan of action. (See also W75-01145) (Poertner)
W75-01144

REGION 'P', PHASE II WATER QUALITY MANAGEMENT PLAN.
Neuse River Council of Governments, New Bern, N.C.
June 1974. 161 p, 24 fig, 26 tab.

Descriptors: *Regional development, *Water resource development, *Water quality control, *North Carolina, *Administration, *Planning, Water pollution control, Environmental control, Water quality standards, Hydrology, Sewage treatment, Regional analysis, Sewer systems, Wastewater treatment.

Water quality problems were studied in a nine-county region of eastern North Carolina, designated Region 'P'. These counties, several of which lie along the Atlantic Ocean, are Carteret, Pamlico, Onslow, Jones, Craven, Lenoir, Greene, Wayne and Duplin. In the Phase I study, four general problems were noted which impact the development and implementation of an effective water quality management plan. These four problems are: land use, types of waste discharges, cost to provide treatment, and time. The Phase II report addresses these problems and lays the groundwork upon which local communities can develop effective water quality management plans. Maps included in the Phase II report complete the Phase I background study. These cover soils limitations, major groundwater aquifers and regional population distribution by township. The implementation of the Water Quality Management Plan will be through the process of the 201 Facilities Plans within the region. Priority lists will be determined by the North Carolina Office of Water and Air Resources. Essential to the development of a workable Water Quality Management Plan is a Regional Growth Policy. This policy should include the recognition of basic natural conditions that either impede or encourage growth, and the socio-economic considerations that impact the region's natural resources and potential. A regional development guide which addresses these considerations is included to guide future growth in a manner consistent with local goals, conducive to the development of public services such as sewer and water, in the most cost-effective manner. (See also W75-01144) (Poertner)
W75-01145

THE NORTHEAST MICHIGAN REGIONAL PLANNING HANDBOOK.
Northeast Michigan Regional Planning and Development Commission, Rogers City.
For primary bibliographic entry see Field 6F.
W75-01147

KINETICS OF SELF-PURIFICATION OF RESERVOIRS CONTAINING STRONTIUM-90 AS A RESULT OF RADIONUCLIDE ABSORPTION BY BOTTOM SEDIMENTS, (IN RUSSIAN),
V. M. Prokhorov, and N. G. Safronova.
Ekologiya. Vol 4, No 2, p 12-18, 1973.

Descriptors: *Strontium, *Self-purification, *Radioisotopes, *Bottom sediments, Reservoirs, Lakes.

A diffusion model previously presented for self-purification of water reservoirs as a result of absorption of Sr90 by bottom sediments, is in agreement with experimental data on the kinetics of change of Sr90 concentration in water of an experimental lake. Along with the diffusion mechanism of self-purification in the lake studied, there are additional factors of self-purification which may be considered within the framework of the model. Simple formulas relating Sr90 concentration in water to time permit a long-term prognosis for the lake in question to be made.--Copyright 1974, Biological Abstracts, Inc.
W75-01152

THE 1971 CHOLERA EPIDEMIC IN ZARIA, NIGERIA,
London School of Hygiene and Tropical Medicine (England).
For primary bibliographic entry see Field 5C.
W75-01155

APPARATUS FOR RECOVERING OIL SUBSTANCES FROM THE SURFACE OF A BODY OF WATER,
U. Favret.
U S Patent No 3,836,004, 7 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 880, September 17, 1974.

Descriptors: *Patents, *Pollution abatement, Water pollution control, Water quality control, *Oil spills, Equipment, Separation techniques, Oil pollution, Skimming, *Floats.
Identifiers: *Oil recovery.

A buoyant float disposed in a body of water has oil inlet ports placed at a level to withdraw oily substance floating on the surface. The ports are sized relative to the size of a connecting oil collection suction chamber so as to permit impeded flow into the chamber and to aid in creation of a vortex-like effect tending to withdraw fluid with a heavy concentration of oil. A remote pump connected to a portion of the float provides suction sufficient to withdraw the oily substance from the collection chamber. Where wind may tend to displace the oil substance, a sail-like wind reaction surface which is attached to the float carries the float and its oil inlet ports. The oil inlet ports are placed so as to be carried above the water level so that in the absence of an upper layer of oily substances, only air is withdrawn. (Sinha-OEIS)
W75-01195

PROCESS AND APPARATUS OF HANDLING WATER WHICH IS CONTAMINATED WITH AN OILLIKE LIQUID,
International Pollution Control Systems, Inc., Washington, D.C. (assignee)
For primary bibliographic entry see Field 5D.
W75-01196

REDUCING WATER POLLUTION FROM PULP MILL SULFITE WASTES,
Michigan Technological Univ., Houghton. Dept. of Chemistry and Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-01200

CATALYTIC OXIDATION OF PHENOL DILUTE CONCENTRATION IN AIR,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-01207

COMPUTER MEMORY REQUIREMENTS FOR DP AND DDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01212

COMPUTER TIME REQUIREMENTS FOR DP AND DDDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01213

ESTIMATION OF AGRICULTURE-FORESTRY TRANSITION MATRICES FROM AERIAL PHOTOGRAPHS,
North Carolina State Univ., Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4C.
W75-01231

A STREAM TRACER STUDY USING LITHIUM AS THE TRACER,
Sonoco Products Co., Hartsville, S.C.
For primary bibliographic entry see Field 5B.
W75-01263

FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA,
Smith (Wilbur) and Associates, Denver, Colo.
G. H. Aull, Jr., and R. J. Zuelsdorf.
Environmental Protection Agency, Region VIII, Denver, Colorado, April 1973. 147 p, 3 fig, 31 tab, 75 ref. EPA Contract 68-01-0734.

Descriptors: *Colorado, *Treatment facilities, *Institutions, *Management, Cities, *Financing, Waste water treatment, Local governments, Institutional constraints, Legal aspects, Water quality control.
Identifiers: *Standard Metropolitan Statistical Area, *Denver(Colo).

Field studies and research were conducted to determine the existing institutional arrangements and financial practices of sixteen wastewater management agencies within the Denver Standard Metropolitan Statistical Area (SMSA). Data for each of the agencies portrayed types and amounts of current revenues and expenditures, projected revenues and expenditures, and how various classes of expenditures are financed. A wide range of institutional and financial arrangements are available to areas and units of government in the provision and operation of wastewater facilities. No optimum form of institutional or financial arrangements was sought, but various criteria are suggested by which the selection might be made. Ample legal authority appears to exist for meeting wastewater management needs within the Denver SMSA provided that the selection of appropriate arrangements can be made by the electorate. Policy and administrative considerations in selecting financial arrangements are more critical to satisfactory solution of needs than are statutory considerations. The scale and scope of the selected jurisdiction was more critical than the precise form of institutional arrangement. Strengthened roles for state, county and municipal governments are foreseen, as well as a continuance of the important function performed by the Denver Regional Council of Governments.
W75-01289

A CURRICULUM ACTIVITIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES: ACTIVITIES, VOLUME 1.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For primary bibliographic entry see Field 6B.
W75-01314

ECONOMIC EFFECTS OF MERCURY POLLUTION ON COMMERCIAL FISHING AND RECREATION-RELATED BUSINESS ON PICKWICK LAKE IN ALABAMA,
Auburn Univ., Ala. Dept. of Economics.
J. W. Granade.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 506, $5.25 in paper copy, $2.25 in microfiche. MS Thesis, December 1973, 93 p, 22 tab, 7 fig, append. OWRT B-029-ALA(1).

Descriptors: *Economic impact, *Mercury, *Water pollution, *Recreation, *Alabama, Lakes, *Commercial fishing, Income distribution, Water utilization.
Identifiers: *Pickwick Lake(Ala), *Externalities.

On July 7, 1973, Pickwick Lake was closed to commercial fishermen, and a warning was given to sports fishermen not to eat fish because of mercury pollution. As a result of the ban, it was reported that incomes of commercial fishermen and sales by recreation-related businesses had decreased. These losses were investigated to determine their extent. Specific objectives were (1) to explore the concept of externalities as related to water use, (2) to determine the impact of the ban on commercial fishermen, and (3) to determine if there was a economic effect on recreation-related businesses. The concept of externality as it relates to the problem was discussed in depth. The effect on commercial fishermen was measured through compilation of the results of a questionnaire. It was shown that the economic effect was negligible to the respondents to the questionnaire. The effect on the sales of a sample of businesses serving the recreationist was examined using sales tax returns for four towns. Percent changes in sales for the period following the ban varied only slightly from similar periods in previous years. It was concluded that the fishing ban and warning had very little economic effect on the business measured.
W75-01317

EFFECT OF MOSQUITO CONTROL CHEMICALS ON AQUATIC FAUNA,
Arkansas Univ., Fayetteville. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W75-01319

SURVEY AND EVALUATION OF PLANT PATHOGENS OF ALLIGATORWEED (ALTERNANTHERA PHILOXEROIDES (MART.) GRISEB.),
Florida Univ., Gainesville. Dept. of Plant Pathology.
H. R. Hill.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 507, $4.25 in paper copy, $2.25 in microfiche. Master of Science Thesis, 1972. 43 p, 7 fig, 2 tab, 63 ref. OWRT B-011-FLA(4). 14-31-0001-3268.

Descriptors: *Biocontrol, Plant pathology, *Aquatic weed control, *Southeast US, *Alligatorweed, *Florida, *Plant diseases, Pathogenic fungi, *Plant viruses.
Identifiers: Glomerella cingulata.

Plant pathogens may offer a means for the biological control of alligatorweed (Alternanthera philoxeroides), an emersed aquatic plant infesting waterways in many areas of the southeastern United States. Three diseases of alligatorweed were found during surveys conducted in Florida and other states in the southeast. These diseases were: (1) a stunting disease believed to be virus-induced; (2) a leaf spot whose causal agent remains unknown; and (3) a yellowing condition apparently due to iron deficiency. Sprigs of alligatorweed were mechanically inoculated with 20 plant viruses. No symptoms were observed on any of the alligatorweed plants three weeks after with any of the viruses. Alligatorweed was also inoculated with Glomerella cingulata, a fungal pathogen of Alternanthera sessilis, a relative of alligatorweed, but none of the plants became infected.
W75-01323

EFFECTS OF WASTEWATER SURCHARGES,
West Virginia Univ., Morgantown. Dept. of Management.
A. H. Montgomery, Jr., and J. A. Seagraves.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 505, $3.25 in paper copy, $2.25 in microfiche. Paper presented at the Annual Meeting of the West Virginia Water Pollution Control Association, Pipestem, West Virginia, April 27, 1973. 15 p, 1 fig, 2 tab. OWRT B-032-NC(8).

Descriptors: *Water pollution control, *Industrial wastes, *Municipal wastes, *Elasticity of demand,

Economics, Effluents, Prices, Water demand, *West Virginia, *North Carolina, *Pollution taxes(Charges), *Water users, Water utilization.
Identifiers: Surcharge(Waste water), *Effluent charges, Economic incentive.

A review is presented of the history, types, and effects of sewer surcharges. Research findings of earlier reports are also reviewed with emphasis on North Carolina experience. Requirements of FWPCA amendments of 1972 for surcharges and related research are interpreted as they appear to apply to West Virginia. (See also W73-02115) (Howells-North Carolina State)
W75-01330

AN ALTERNATIVE APPROACH FOR DERIVING PRODUCTION AND COST FUNCTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W75-01338

A CITIZEN'S GUIDE TO CLEAN WATER.
Izaak Walton League of America, Arlington, Va.
June, 1973. 93 p, append. EPA 68-01-0858.

Descriptors: *Legislation, *Water pollution, *Water Pollution Control Act, *Water quality control, *Water pollution effects, Water pollution treatment, Waste disposal, Effluents, Industrial wastes, Industrial water, Toxicity, Public benefits, Federal government, State governments, Public health, Water permits, United States, Licenses, *Public participation.

The objectives, standards and controls of the Federal Water Pollution Control Act of 1972 are outlined for the purpose of identifying areas of opportunity for citizen participation. Industrial standards of effluent and toxic effluent are analyzed in the context of the citizen's role of public enforcement. Potential citizens' input regarding a three year review process of upgrading water quality standards is identified. Public participation in improving waste treatment planning and in the State Continuing Planning Process is discussed. Public involvement is recommended in the Level B Plan which encourages cooperation among a broad spectrum of state and federal agencies with statutory responsibility for water pollution control, land use, and related environmental programs. Citizen involvement in approval of state permit programs and in public hearings in which the decisions are made concerning permits is encouraged. Citizen action in the enforcement of permit conditions is outlined. Legal action by a citizen through the means of citizen suits is examined relative to the federal and state enforcement of the Water Pollution Control Act. (Kelly-Florida)
W75-01339

RESOURCE CONSERVATION AND RECYCLING, (PARTS I AND II).
For primary bibliographic entry see Field 6G.
W75-01343

CHALMETTE PUBLIC HEARINGS TESTIMONY, (LOUISIANA).
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 4A.
W75-01344

CONGRESSIONAL INTENT OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT,
Committee on Public Works (U.S. House).
L. Edelman.
Journal--Water Pollution Control Federation, Vol 45, No 1, p 157-164, January 1973. 8 p.

Descriptors: *Water quality control, *Federal Water Pollution Control Act, *Grants, *Federal project policy, *Waste treatment, Water pollution treatment, Cost sharing, Waste water disposal, Waste disposal, Treatment, Aeration, Treatment facilities, Waste water, Waste water treatment, Regulation, Technology, Federal budget, Project purposes, Financing, Water Quality Act, Water pollution, Legislation, Permits.

Hearings beginning in 1971 which revealed a need for a new pollution control act are described. The Federal Water Pollution Control Act of 1972 (FWPCA) establishes a national goal to eliminate discharges into navigable waters by 1985 and to achieve a defined water quality by 1977. Under the FWPCA, industries are required to use the best practicable control technology by 1977, and in addition, must meet established water quality standards. By 1983, the nation's industries are required to use the best available technology economically available. Waste treatment plant construction grants totaling $18 billion have been authorized. The administrator can commit the federal government to future payment of funds, on a proportionate basis, hence more projects can be initiated sooner. The funds are to be allotted to the states on the basis of need. After 1974, grant applicants will be required to show that the proposed treatment techniques represent the application of the best technology. After 1973, user charges must be established by grant applicants. User charges will assure that each recipient of waste treatment services will pay its share of treatment costs. (Hunter-Florida)
W75-01345

ANNUAL REPORT JULY 1971 THROUGH DECEMBER 1972,
North Carolina Univ., Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 6B.
W75-01348

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3A,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01353

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3B,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01354

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3C,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01355

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, FOURCHE LAFAVE RIVER, SEGMENT 3D,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01356

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3E,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01357

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, PETIT JEAN AND POTEAU RIVERS, SEGMENT 3F,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01358

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, SEGMENT 4E,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01359

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, RED RIVER BASIN, SEGMENT 1C,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01360

SURVEY OF PULP AND PAPER INDUSTRY ENVIRONMENTAL PROTECTION EXPENDITURES AND OPERATING COSTS -- 1973,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-01380

EFFECT OF MIXED-GRASS AND NATIVE-SOIL FILTER ON URBAN RUNOFF QUALITY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5F.
W75-01395

WATER QUALITY IN THE LOWER COLORADO RIVER AND THE EFFECT OF RESERVOIRS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W75-01396

EFFECT OF CHANGING WATER QUALITY AND SUPPLY ON IMPERIAL VALLEY, CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
J. H. Snyder, and C. V. Moore.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 677, $3.25 in paper copy, $2.25 in microfiche. Completion Report, (January, 1974), (UCAL-WRC-W-244). 9 p, 10 ref. OWRR B-147-CAL(1), B-136-CAL(1), B-120-CAL(1), B-094-CAL(1).

Descriptors: *Water quality, *Salinity, *Irrigation water, Recreation, Water rights, *Water supply, *California, Model studies.
Identifiers: *Imperial Valley(Calif), Salton Sea(Calif), *Colorado River(Calif).

This research project investigated the short- and long-term effects of increased salinity and reduced water supply in the lower Colorado River on the economy of the Imperial Valley of California. The Imperial Valley irrigated agriculture phase investigated how agricultural production might be affected by changes in quantity and quality of irrigation water including implications for farms of different sizes. A simulation model was developed for the Salton Sea area projecting recreational use as a function of a large number of complex variables. A legal phase studied established laws and possible legislation and agreements to assess possible rights and remedies of California and lower basin water users regarding variation in water quality. A hydro-salinity model for an upper basin watershed was developed to evaluate contributions to salt loading from upland irrigated agriculture and from natural causes.

W75-01397

RELATIONSHIP OF VARIOUS INDICES OF WATER QUALITY TO DENITRIFICATION IN SURFACE WATERS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-01404

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT LEVELS ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W75-01407

WATER QUALITY CONTROL: NONLINEAR PROGRAMMING ALGORITHMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
G. Graves, D. Pingry, and A. Whinston.
Automatique Informatique Recherche Operationnelle, Vol 2, p 49-78, 1972. 4 fig, 3 tab, 18 ref, 2 append. OWRT B-020-IND(22).

Descriptors: *Water quality control, *Water pollution treatment, *Flow augmentation, *Pollution abatement, Dissolved oxygen, Algorithms, Mathematical studies, River basin development, *Indiana, Model studies.
Identifiers: *Non-linear programming, By-pass piping, West Fork White River(Ind).

Some more practical aspects of nonlinear programming are presented, along with an application of this technique to a river basin water quality control problem. A nonlinear river basin model is formulated which minimizes total cost of abatement structures subject to water quality goals to be satisfied. The water quality measure used is dissolved oxygen. The treatment alternatives allowed are regional and on-site treatment plants, by-pass piping and flow augmentation. Results of an application of this model to the West Fork White River in Indiana are presented. A discussion is presented of the nonlinear algorithm which is used to solve the nonlinear problem. The algorithm described is stepwise in nature. Discussion is focused on the determination of the parameters of the linear programming problem. The problems of storage space, variable priority classes and calculation of partial derivitives are also considered.
W75-01410

WATER FOR THE HUMAN ENVIRONMENT, VOLUME 1, CONGRESS PAPERS.
International Water Resources Association, Champaign, Ill.
For primary bibliographic entry see Field 6B.
W75-01428

THE CONSEQUENCES OF BUILDING DAMS ON THE ENVIRONMENT,
For primary bibliographic entry see Field 6G.
W75-01431

THE INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH,
G. J. Stander, and B. B. Berger.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 199-204.

Descriptors: *Organizations, *Water pollution, *Conferences, *Research and development, Publications, Management, Planning, Coordination.
Identifiers: Water pollution research, *International association.

The International Association on Water Pollution Research was formed to respond to a growing need for sharing and applying effectively new knowledge on water pollution emerging from laboratories and field studies in many nations. The Association's genesis was the First International Conference on Water Pollution Research in 1962. The Association was formally organized in 1965 and currently has 23 nations represented on its Governing Board. It conducts biennial conferences and specialized regional conferences. Its official Journal, WATER RESEARCH, is published monthly. The Association consults and collaborates with other international organizations, intergovernmental and non-governmental, concerned with environmental quality and considers this type of cooperation essential to the protection of environmental quality on global scale. (See also W75-01428) (Humpreys-ISWS)
W75-01446

BERMUDA TUNNELS FOR FRESH WATER,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 4B.
W75-01464

SEA PROTECTION AGAINST CONTAMINATION WITH OIL-CONTAINING WASTE WATER,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
For primary bibliographic entry see Field 5D.
W75-01466

OIL AND HAZARDOUS SUBSTANCE POLLUTION CONTROL ON THE OPEN SEA,
Northrop Services, Inc., Arlington, Va.
S. M. Pristoop.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 400-425. 2 fig.

Descriptors: *Planning, *Water pollution control, *Environment, *Pollution abatement, *Water pollution, Oil, Control, Research and development, Economics, Oceans, Systems analysis, Evaluation, Oil spills, Water pollution sources, Management, Design, Analytical techniques, Ecology.
Identifiers: Hazardous substance pollution, Spill prevention.

The research and development activity leading to abatement of pollution from oil and hazardous substances must be methodical, with timely provision of all anticipated inputs to each study, design, or development task. The first step is a thorough problem definition, including a definition of the pollution threat, an adequate description of the environment, determination of the fate of pollutants in the environment, and a risk analysis associated with a pollution event. This analysis permits definition of the performance and operational requirements of an abatement system. It was recommended that concept formulation and design proceed for an oil spill pollution control and abatement system, the hazardous substance pollution threat be separately defined, requirements for a hazardous substance pollution control and abatement system be subsequently identified, and the oil pollution recovery system be evaluated in terms of the modifications required to give it competence against hazardous substances. A methodical systems approach to develop, test, and evaluate a pollution abatement system, as well as a discussion of spill prevention, was included. However efficiently the program described is managed, the sheer magnitude of this effort dictates financial resources that are available only to national governments. Substantial United States Government support over many years is clearly requisite to achieve the objectives of this program. International support and technical cooperation would increase the scope and depth of the possible research activity and thereby hasten the achievement of a competent pollution control and abatement capability. (See also W75-01428) (Humphreys-ISWS)
W75-01468

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, TYRONZA RIVER, SEGMENT 5D
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01516

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, ST. FRANCIS RIVER, SEGMENT 5C,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01517

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ST. FRANCIS RIVER BASIN, L'ANGUILLE RIVER, SEGMENT 5B,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01518

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, BAYOU DEVIEW, SEGMENT 4B,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01519

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, ARKANSAS RIVER BASIN, ARKANSAS RIVER, SEGMENT 3G,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01520

WASTE-LOAD ALLOCATION STUDIES FOR ARKANSAS STREAMS, WHITE RIVER BASIN, CACHE RIVER, SEGMENT 4C,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 5B.
W75-01521

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION: OBJECTIVE, ORGANIZATION AND EXTENT OF PROGRAM, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
C. Forsberg.
Vatten. 29(4): 456-463, Illus. 1973. English summary.
Identifiers: Environment, Lakes, Organizations, Polluted lakes, Recovery, Sewage, *Wastewater treatment, *Sweden, *Research programs.

The Swedish research program on lake recovery after introduction of advanced wastewater treatment for P removal or more total diversion of sewage began during 1972. the main objective is to elucidate the effects of the effluents from chemical treatment plants in recipient lakes of different types. The efficiency of 13 sewage treatment plants is continuously monitored. The nutrient loadings from these plants and from other sources are calculated. The recovery processes are studied in 20 lakes. Background data for these lakes are presented. The extent of the sampling program is illustrated. The total number of sampling points and the total number of samples per year are 171

and 10,735, respectively. The project is running in cooperation with 13 provincial governments and 16 municipalities. (See also W75-01600)--Copyright 1974, Biological Abstracts, Inc.
W75-01599

RECOVERY OF POLLUTED LAKES: NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD RESEARCH PROGRAM ON THE EFFECTS OF ADVANCED WASTEWATER TREATMENT AND SEWAGE DIVERSION: SURFACE WATER QUALITY OF RECIPIENTS, AUGUST-OCTOBER, 1972, (IN SWEDISH),
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
C. Forsberg, and S.-O. Ryding.
Vatten. 29(4): 464-468, Illus. 1973. English summary.
Identifiers: Environment, Lakes, Polluted lakes, Recovery, Sewage, *Wastewater treatment, Sweden, *Research programs, Water quality.

The research program for studying the effects of advanced wastewater treatment for P removal and sewage diversion on lake recovery began in 1972. To obtain detailed knowledge of the recovery process, studies must be carried out over several years in a number of different lake types. Information is not yet available concerning changes of the conditions in these lakes. To record the water quality of the lakes at the start of this investigation data on content of total P of the surfact water (0-2 m) for the period Aug.-Oct., 1972, are presented. (See also W75-01599)--Copyright 1974, Biological Abstracts, Inc.
W75-01600

OIL SPILL RECOVERY VESSEL.
Netherlands Patent NL 7315-128. Applied November 5, 1973. Issued May 8, 1974. Netherlands Patent Report, Vol 5, No 21, p 1, June 28, 1974.

Descriptors: *Patents, *Oil spills, *Pollution abatement, Equipment, Oil, Floating, Weirs, *Separation techniques, *Skimming.
Identifiers: Netherlands, *Recovery.

Oil floating on water is recovered using a vessel with a cyclone chamber into which a skimmed layer is admitted via a lateral opening, one edge of which is defined by an adjustable skimmer or weir plate, the inflow to the chamber being solely dependent on the translational speed of the vessel. The oil is tapped from the larger diameter end of the chamber while separated water is discharged from the smaller diameter end. The chamber may have a horizontal or vertical axis. (Murphy-FIRL)
W75-01633

CLEAR-SPAN DOMES COVER WATER TANKS.
Public Works, Vol 105, No 7, p 90, July, 1974. 1 fig.

Descriptors: *Potable water, *Water quality control, *Aluminum, Oregon, Construction materials, Pollution abatement, Maintenance costs, Installation, *Storage tanks.

The installation of Geodesic-type domes on two potable water storage tanks brought the City of Bend, Oregon, into compliance with State water storage regulations. The city had experienced problems with pollen, pine needles and other objects falling into the open-topped 1.5 MG steel tanks. Temcor all-aluminum PolyFrame Domes were selected to roof the tanks. They are made of aluminum struts and gussets assembled to form a fully triangulated space truss, and are covered with triangular closure panels of 16-gauge aluminum sheet. An all-aluminum vent with bird screen and a 3 by 3-ft. aluminum access hatch completes the structure. The domes were assembled at ground level and hoisted into position atop and riveted steel tanks with a crane. Cost of the two domes was $95,380 installed. Little maintenance cost is anticipated since the domes require no painting. (Murphy-FIRL)
W75-01639

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SCREENING MODEL FOR STORM WATER CONTROL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-01110

OPTIMAL WEIGHTING FUNCTION IN WATER QUALITY MODELING,
University of Southern California, Los Angeles. Dept. of Chemical Engineering; and University of Southern California, Los Angeles. Dept. of Electrical Engineering and Materials Science.
For primary bibliographic entry see Field 5B.
W75-01111

USE OF SYSTEMS APPROACH IN WATER RESOURCES PLANNING,
Singapore Univ., Faculty of Engineering.
A. Sundar.
Indian Journal of Power and River Valley Development, Vol 24, No 2, p 43-45, February 1974. 4 ref.

Descriptors: *Water resources, *Planning, *Systems analysis, Decision making, Optimization, Comprehensive planning, Alternative planning, Multiple purpose, Water utilization, Environmental engineering, Linear programming, Dynamic programming, Simulation analysis, Economic efficiency, Income distribution.
Identifiers: Objective function, Environmental quality.

The objectives of water resources planning belong in three general categories: economic efficiency, income distribution, and environmental quality. The planning process entails making a series of decisions involving the iterative adjustment of the objectives (many aspects of which are nonquantifiable and noncommensurate), the consideration of alternative systems and their physical dimensions, and the derivation of an optimal operating policy. Because of the interdependencies of withdrawals and uses of water, the intimate interlinkages in the decision steps of the planning process, and the socioeconomic, technological and political instruments available for manipulating water demands and supplies, a comprehensive systems approach using operations research techniques is needed. Optimization methods, such as linear, nonlinear, and dynamic programming are powerful tools, but usually require the real system to be considerably simplified for application. Simulation techniques require less such modification but do not lead to direct optimization. A search technique used in conjunction with a simulation model is the recommended method. The combined efforts of engineers and scientists could lead to more powerful operations research techniques with enhanced capabilities for analyzing actual complex, multiple-objective water systems. (Bell-Cornnell)
W75-01112

A PROCESS FOR FEDERAL WATER PLANNING AT THE FIELD LEVEL,
Stanford Univ, Calif. Dept. of Civil Engineering.
L. Ortolano.
Water Resources Bulletin, Vol 10, No 4, p 766-778, August 1974. 4 fig, 1 tab, 8 ref.

Descriptors: *Water resources development, *Planning, *Evaluation, Model studies, Forecasting, Alternative planning, Long-term planning, Constraints, Flood control, *California.
Identifiers: Planning process, Federal agencies, Public participation, Impact analysis, Field level, Objectives, *Carmel Valley(Calif).

A process for planning at the field offices of Federal water resources agencies is described. The process involves both planners and publics in the following four planning activities: problem definition, formulation of alternatives, impact analysis, and evaluation (or plan ranking). Evaluative factors are defined as the goals, concerns, constraints, etc., that the affected publics and other decision makers consider in ranking alternative actions. These factors serve to drive the entire process and glue the four planning activities together. In contrast to other normative, descriptive models of the planning process, the four activities are considered to be carried out simultaneously and continually from the beginning of the process. As the planning process proceeds, each activity is repeated a number of times at increasing levels of detail. Various aspects of the process are illustrated by means of an example involving water resources development in Carmel Valley, California. (Bell-Cornell)
W75-01115

THE OXYGEN SAG EQUATION: NEW PROPERTIES AND A LINEAR EQUATION FOR THE CRITICAL DEFICIT,
International Business Machines Corp., Gaithersburg.
For primary bibliographic entry see Field 5A.
W75-01118

MODELING AND OPTIMIZATION OF WATER RESOURCES SYSTEMS --- PHASE III, STOCHASTIC MODELING AND OPTIMIZATION OF THE WALNUT AND POTEAU RIVER BASINS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 4A.
W75-01210

COMPUTER MEMORY REQUIREMENTS FOR DP AND DDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01212

COMPUTER TIME REQUIREMENTS FOR DP AND DDDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01213

MULTIRESERVOIR OPTIMIZATION MODEL,
Natal Univ., Durban (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01226

PERSISTENCE OF HIGH DAILY DEMANDS IN AUSTRALIAN WATER SUPPLY SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 6D.
W75-01246

AN ALTERNATIVE APPROACH FOR DERIVING PRODUCTION AND COST FUNCTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
J. R. Marsden, D. E. Pingry, and A. Whinston.

In: Urban and Regional Systems, Proceedings of the Sixth Hawaii International Conference on Systems Sciences, 1973. p 166-169, 5 ref. OWRR A-024-IND(4).

Descriptors: *Decision making, *Optimum development plans, *Waste water treatment, Project planning, Cost allocation.
Identifiers: *Production function, Cost function, Mass balance.

An alternative approach is described which ties the derivation of the production function form to reaction formulas common in chemical engineering and biology. The basis of the functional form is shifted from 'desirable' economic properties to physical aspects of the process under consideration. The validity of the representation hinges on the accuracy of the reaction equations used rather than on the validity of assumptions concerning economic conditions. (Wiersma-Purdue)
W75-01338

MASS BALANCE AND ECONOMIC MODELS,
Purdue Univ., Lafayette, Ind.
J. R. Marsden, D. R. Pingry, and A. Whinston.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 528, $3.25 in paper copy, $2.25 in microfiche. (1973). 12 p, 1 tab, 1 fig, 8 ref. OWRR A-024-IND(6).

Descriptors: Water resources, *Planning, *Leontief models, *Model studies, *Optimization, *Computer programs, Input-output analysis.
Identifiers: *Mass balance(Accounting), *Economic models.

Mass balance is not a sophisticated scientific theory but simply a method of accounting. Mass balance is discussed in general terms as a procedure to construct models comparable in all disciplines, including economics. The relation between the generalized mass balance approach and two traditional problem forms is discussed, followed by a discussion of the implications. (Wiersma-Purdue)
W75-01388

ECONOMICS OF WASTEWATER TREATMENT: THE ROLE OF REGRESSION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W75-01405

WATER QUALITY CONTROL: NONLINEAR PROGRAMMING ALGORITHMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W75-01410

REGIONAL SYSTEMS AND HYDRAULIC GRIDS,
Tahal Consulting Engineers Ltd., Tel Aviv, Israel.
A. Wiener.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 174-180.

Descriptors: *Water resources development, *Planning, *Regional development, Regional analysis, Networks, Long-term planning, Hydraulics, Water resources.

No ready-made solutions are applicable to the development and management of water resources systems because of the specificity, complexity, and sensitiveness of their flow and quality equilibria. No generally valid statement can therefore be made as to the preferability of regional systems and hydraulic grids as compared with simpler layouts. The emphasis in the solution of water resources management problems has in the past been so exclusively on local, as-hoc solutions, conceived for limited areas, needs and time horizons, that the time has come to institute the medium- and long-term regional solution, and to define the conditions under which the multiple requirements of modern development call for these broader planning concepts, and for their most extreme form, the hydraulic grid. Advantages and disadvantages of the regional approach were outlined and application of the hydraulic grid system to a case history in Israel was discussed. (See also W75-01428) (Humphreys-ISWS)
W75-01443

INTERBASIN TRANSFER OF WATER,
Malviya Regional Engineering Coll., Jaipur (India).
For primary bibliographic entry see Field 4A.
W75-01452

INTEGRATED SURFACE-GROUND WATER DEVELOPMENT ON A REGIONAL BASIS--THE SAN ANTONIO, TEXAS STUDY,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W75-01455

PROBLEMS ENCOUNTERED IN MULTIDISCIPLINARY RESOURCES AND ENVIRONMENTAL SIMULATION MODELS DEVELOPMENT,
Washington Univ., Seattle. Dept. of Civil Engineering.
B. W. Mar.
Journal of Environmental Management, Vol 2, No 1, p 83-100, 1974. 14 ref. NSF GI-36373.

Descriptors: *Model studies, *Environment, Technology, Hazards, Documentation.
Identifiers: *Interdisciplinary modelling.

An experiment was conducted to assess and document interdisciplinary environmental modelling activities. Groups of modellers visiting each of eleven RANN projects were used to stimulate inter and intra project discussions of the modelling process. Results indicated that the process is seldom recorded and the technology of interdisciplinary modelling has not been captured. Each new effort fails to maximize use of past experiences and three common issues are faced repeatedly: how to define and bound the model, how to orchestrate the team to address the construction and validate the defined model; and how to document and communicate the model or its results. The needs for standards for model definition in proposals, for demonstration or project orchestration and documentation, and standardized model subsectors for validation are answered by a series of recommendation. It is further recommended that a task group be appoined to draft formal statements, including examples, that can be adopted as formal proposal specifications, and a sequence of funding increments that would increase the effectiveness of modelling efforts. Without these first steps toward standardizing model development, the fragmentation and abuse of modelling will continue. (Jones-Wisconsin)
W75-01500

6B. Evaluation Process

A CASE STUDY OF THE LOCAL ECONOMIC IMPACT OF RESERVOIR RECREATION,
Tennessee Univ., Knoxville. Coll. of Business Administration.
C. B. Garrison.
Journal of Leisure Research, Vol 6, Winter, p 7-19, 1974. 7 tab, 13 ref. OWRT A-020-TENN(4). 14-31-0001-3543.

Descriptors: *Reservoirs, *Recreation, Recreation facilities, Expenditures, *Economic impact, Income, Employment, Economics, *Tennessee.
Identifiers: *Norris Lake(Tenn).

Reservoir recreation affects the economy of the local area in which the reservoir is located. Expenditures by recreation visitors represent exports of goods and services by the public and private enterprises catering to their demands. Availability of a comprehensive survey of expenditures made by visitors to Norris Lake made it possible to estimate the impact on both personal income and employment in the three-county area in which the bulk of Norris shoreline is located. Economic base theory is used to estimate induced income and employment multipliers and thereby to estimate the secondary economic impact of recreation expenditures. Although Norris is one of the most popular Tennessee Valley Authority reservoirs, it was found that recreation's contribution to the local economy had been negligible, especially when compared to either the positive effect of manufacturing or the negative effect of the agricultural decline
W75-01106

COOPERATIVE COMMUNITY-UNIVERSITY WATER RESOURCE PLANNING: AN INTERDISCIPLINARY APPROACH,
Wisconsin Univ. Center, Marinette.
A. J. Bedrosian, W. O. Bennett, J. E. Berry, R. B. Ditton, and J. W. Kolka.
Water Resources Bulletin, Vol 8, No 5, p 887-899, 1972. 2 fig, 9 ref. OWRT B-046-WIS(9), B-065-WIS(3). 14-31-0001-3353, 14-31-0001-3667.

Descriptors: Camping, Water sports, *Attitudes, Economics, Lakes, *Social aspects, *Decision making, *Watershed management, Aquatic weeds, *Environmental effects, *Wisconsin, *Planning, *Recreation.
Identifiers: *Marinette County(Wis).

An approach is outlined to planning the management of a lake heavily used for recreation and of substantial importance to the tourist economy of northeastern Wisconsin. A framework, utilizing a three dimensional matrix, is developed to analyze levels of public concern, management alternatives and action agencies. Structural and non-structural alternatives are examined and evaluated on the basis of social and economic criteria, long- and short-term environmental impact and legal-political feasibility. Data requirements which created the necessity for an interdisciplinary approach involving social, physical, and biological sciences are enumerated. The role of universities in assisting communities with resource management planning is examined and the attributes in academic institutions which desire to successfully attach resource planning problems are described.
W75-01109

USE OF SYSTEMS APPROACH IN WATER RESOURCES PLANNING,
Singapore Univ., Faculty of Engineering.
For primary bibliographic entry see Field 6A.
W75-01112

A PROCESS FOR FEDERAL WATER PLANNING AT THE FIELD LEVEL,
Stanford Univ, Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W75-01115

GROUNDWATER MANAGEMENT AND SALINITY CONTROL,
Rhode Island Univ., Kingston. Dept. of Resource Economics.
For primary bibliographic entry see Field 4B.

W75-01117

BENEFIT-COST ANALYSIS RECONSIDERED: AN EVALUATION OF THE MID-STATE PROJECT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Political Economy.
S. H. Hanke, and R. A. Walker.
Water Resources Research, Vol 10, No 5, p 898-908, October 1974. 7 tab, 34 ref.

Descriptors: *Cost-benefit analysis, *Evaluation, Projects, *Reclamation, *Political aspects, Economics, *Decision making, Planning, Governments, Water resources, Systems analysis, *Nebraska.
Identifiers: *Platte River Valley(Neb).

In order to illustrate both the practical application and the inherent problems of cost-benefit analysis, the proposed Nebraska Mid-State reclamation project is reevaluated; a critical view is taken of the project and the Bureau of Reclamations's practices in using cost-benefit analysis. The paper shows how the tools of economics can be used by different analysts to arrive at widely divergent conclusions and how many of the assumptions which are the basis for these different conclusions are fundamentally political in nature. This study points out the politically expedient elements of bureau analysis that remain after almost 30 years of refinement and criticism by economists, and acts as a lesson to reformers who fail to recognize the limitations of benefit-cost analysis in replacing the inherently political choices of democratic government. Although benefit-cost analysis can enlighten us on many issues, such as the value of wildlife or the effect of government programs on agricultural markets, it does not provide us with an unambiguous technical solution to public expenditure decisions. In spite of years of refinement in the theory of benefit-cost analysis, no one has succeeded in making it impartial or indisputable. The Bureau, it is concluded, tends to overstate benefits and understate costs. (Bell-Cornell)
W75-01119

A UTILITY APPROACH TO THE VALUATION OF RECREATIONAL AND AESTHETIC EXPERIENCES,
University of New England, Armidale (Australia).
J. A. Sinden.
American Journal of Agricultural Economics, Vol 56, No 1, p 61-72, February 1974. 3 fig, 6 tab, 11 ref.

Descriptors: *Recreation, *Market values, Economics, *Mathematical models, *Benefits, Methodology, Surveys, Data collections, Demand, Equations, Lakes, *Oregon, Systems analysis, *Aesthetics.
Identifiers: Indifference maps, *Utility functions, Travel-cost method, Extra-market benefits.

A method for valuing extra-market benefits is proposed and tested. The method rests on the empirical derivation of utility functions and indifference maps. Demand schedules were obtained from the indifference maps to provide specific benefit values. The method is compared to the conventional travel-cost method for valuing recreational benefits. It is argued that the utility approach is conceptually superior. Also, the utility data comprise both the benefit values from the indifference maps and direct survey responses as surrogates for utility. These data prove better predictors of consumption than the usual travel-cost variables. The Ramsey model of utility estimation is considered along with its empirical application to determine a single total utility curve for days of recreation at a specific state park in Oregon. (Bell-Cornell)
W75-01122

ORGANIZATIONAL EVALUATION OF INDUSTRIAL WATER POLLUTION CONTROL IN THE NEW YORK REGION,
New York Univ., N.Y. Graduate School of Public Administration.
For primary bibliographic entry see Field 5G.
W75-01129

IMPACT OF WATER UTILITY POLICIES ON GROWTH PATTERNS,
Marin Municipal Water District, Corte Madera, Calif.
W. R. Seeger.
Paper presented at the International Public Works Congress and Equipment Show, American Public Works Association, Denver, Colorado, September 15-20, 1973. 28 p.

Descriptors: *Financing, *Water supply development, *Urbanization, *Bond issues, *Water districts, *Planning, Capital costs, Financial feasibility, City planning, Government finance, Governments, Public utility districts, California, Water policy, Administration, Cities, Community development.
Identifiers: *Marin County(California), Public participation.

'Expansion' and 'Growth' have, in recent years, become unpopular terms with voters, who are now more concerned with preservation, conservation and ecology. As evidence of this, the Marin Muncipal Water District, located in Marin County, California, immediately north of San Francisco, in 1971 suffered an overwhelming 9 to 1 defeat of a major bond issue. This was totally unexpected because all bond issues of the District were approved by voters during the period 1916 to 1970. The six proposals presented during this time were approved readily except for the 1970 proposal which passed by a mere 1/2% above the required two-thirds majority. In reviewing the circumstances of this bond election, several conclusions were drawn. One was the need for improvements and pertinent facts must be explained to the local voters without the water utility agencies becoming directly involved in promotion. It is recommended that a well-financed committee of interested citizens should be formed to provide funding necessary to bring out the positive side of any water project. Water utilities should work closely with city, county, and local planning commissions. Committees should include representatives of all interests and groups even those that may oppose a project. Town meetings, attended by the Board of Directors, and press releases could attract the attention and participation of the 'interested silent community'. A general seminar could be held to congeal the information received. Then, the utility should develop a plan that meets the desires as well as the needs, of the community. (Poertner).
W75-01142

WATER AND WASTEWATER--SUMMARY OF A PLAN FOR WATER-SEWER DEVELOPMENT IN THE LAKE-PORTER REGION, INDIANA.
Lake-Porter County Regional Transportation and Planning Commission, Highland, Ind.
(1973), 20 p, 2 fig, 2 tab.

Descriptors: *Planning, *Indiana, *Water supply development, *Waste water treatment, *Urban drainage, *Regional analysis, Regional development, Comprehensive planning, Sewerage, Water supply, Waste water disposal, Water pollution control, Storm drains, Municipal water, Municipal wastes, Cities.
Identifiers: *Lake County(Indiana), *Porter County(Indiana).

Highlights are summarized of a plan adopted by the Lake-Porter Regional Transportation and Planning Commission for water supply and sewer development in Lake County and Porter County, Indiana. This plan serves two purposes: to provide supply and sewer service in the two-county region from the present to 1990, and to qualify local communities for federal water and sewer grants-in-aid through federal certification of the plan as a prerequisite for rendering said grants. The master plan includes preliminary costs, a short-range capital program and interim capital improvement needs by which the Federal government can evaluate the degree to which its investments in water and sewer developments are cost-effective. The plan also meets federal requirements for area-wide planning, and is a part of the overall Regional Comprehensive Plan currently being developed. The long-range proposals call for water supply sources at Hammond, Whiting, East Chicago, Gary-Ogden Dunes and Valpariso. There would be nine major wastewater collection/treatment systems. These would be located at Hammond, East Chicago, Gary, Hobart, Crown Point, Chesterton, Portage, Lowell and Valpariso. Existing, small water supply systems and wastewater systems would be phased out eventually and integrated with one of the larger systems. The political-institutional entities needed to implement the long range elements of the plan would be in the form of multi-community sanitary districts and water supply districts. The state plan for tertiary wastewater treatment and stormwater control is adopted as part of the Plan. (Poertner)
W75-01146

THE GEOLOGIC STORY OF CANYONLANDS NATIONAL PARK,
Geological Survey, Reston, Va.
S. W. Lohman.
Available from GPO, Washington, D.C. 20402. Price $2.65 (paper cover). Bulletin 1327, 1974. 126 p, 81 fig, 51 ref.

Descriptors: *National parks, *Utah, *Recreation facilities, *Canyons, *Colorado River, Scenery, Topography, Geomorphology, Geology, Stratigraphy, Erosion.
Identifiers: *Canyonlands National Park.

On September 12, 1964, President Lyndon B. Johnson signed an act of Congress establishing Canyonlands as the thirty-second national park, the first addition to the park system since 1956. The newborn park covers 525 square miles at the junction of the Green and Colorado Rivers in Utah. The Canyon Lands section of the Colorado Plateau comprises a high plateau, generally ranging in altitude from 5,000 to 7,000 feet, which has been intricately dissected by thousands of canyons. Canyonlands National Park is drained entirely by the Colorado and Green Rivers, whose confluence is an important and scenic central feature of the park. The desert climate has combined with the nearly flat lying layers of sediments of different character, hardness, and thickness to produce steep slopes having many cliffs and ledges and generally sharp to angular edges rather than the subdued rounded forms of more humid regions. (Knapp-USGS)
W75-01163

LANDSCAPE AESTHETICS NUMERICALLY DETERMINED: APPLICATIONS TO HIGHWAY CORRIDOR SELECTION,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
W. N. Melhorn, and E. A. Keller.
In: Highway Research Record No 452, Photogrammetric Analysis of Urban and Rural Environments 1973. p 1-9, 4 fig, 2 tab, 1 ref. OWRT A-018-IND(2).

Descriptors: *Landscaping, *Aesthetics, *Highways, Recreation facilities, Roads, Valleys, Streams.
Identifiers: *Uniqueness ratio, *Uniqueness index, *Aesthetic river index.

Because considerable controversy commonly surrounds testimony concerning environmental effects of highway construction, a quantitative

method to evaluate aesthetic factors of a landscape is needed. Such an evaluation will help to separate facts from emotions and to provide a means to hierarchically rank various alternative sites or corridors. The LAND system, which is discussed, provides a preliminary method to quantify aesthetic factors of a landscape and to visually inspect hierarchically ranked alternatives. The model is an extension of Leopold's (1969) concept of landscape uniqueness. Descriptive evaluation numbers for various landscape factors are used to derive indexes, which are then used to evaluate and compare different landscapes. Data are obtained from measurements and observations from topographic maps, aerial photographs, and field work. This type of parametric analysis may find application in the planning stages of many highway engineering projects. However, the system is only an additional tool in a decision-making process involving the selection of alternative routes whose construction would significantly modify existing landscapes.
W75-01227

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 6D.
W75-01254

AUSTRALIAN REPRESENTATIVE BASINS PROGRAMME--PROGRESS 1973.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 7C.
W75-01310

A CURRICULUM ACTIVITIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES: ACTIVITIES, VOLUME 1.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.25. 1972. 217 p. Grant 1TT1-WP-41-01.

Descriptors: *Education, *Water pollution, *Training, *Environment, Social aspects, Hydrologic cycle, Political aspects, Ecology.
Identifiers: *Curriculum activities guide, Human activities.

There is great desire on the part of students today to be directly involved in society and its problems. The guide is designed to bring students and their educational process into direct contact with their society and community. The broad subject areas are: (1) Hydrologic Cycle, (2) Human Activities, (3) Ecological Perspectives, and (4) Social and Political Factors. Each chapter lists from ten to sixteen activities (specific subjects) for investigation. The seven part outline for each activity is: introduction, questions, equipment, procedure, past studies, limitations, and bibliography. Three levels of activities are provided: Those which increase awareness; those which allow students and teachers to take actions related to particular concerns; and those which are on-going problem investigations. Persons of all age levels are potential participants. (Humphreys-ISWS)
W75-01314

ANNUAL REPORT JULY 1971 THROUGH DECEMBER 1972,
North Carolina Univ., Chapel Hill. School of Public Health.
J. Lyman, and W. L. Rickards.
Sea Grant Publication UNC-SG-73-13, June, 1973. 158 p, 31 fig, 26 tab, 4 append.

Descriptors: *North Carolina, *Coasts, *Environment, *Aquatic habitats, *Environmental engineering, Natural resources, Water resources, Water resources development, Estuaries, Fisheries, Water pollution, Water pollution sources, Pollution abatement, Air pollution, Conservation, Solid wastes, Waste disposal, Environmental effects, Shores, Marine biology, Water law, Flow, Water quality control, Water utilization, Economics, Area redevelopment.

The University of North Carolina Sea Grant program is primarily directed at providing solutions in two major problem areas. The first is the necessity for raising the level of economic development in the eastern part of North Carolina. The second concerns the necessity to preserve the environment of North Carolina. Pollution of the air, addition of domestic, agricultural and industrial wastes to the waterways, disposal of solid wastes, the possibility of shoreline erosion, and the danger of damaging renewable marine resources require attention. Project summaries are included for programs involving aquaculture and fisheries, estuarine studies, ocean law and ocean engineering. Among the nineteen projects reported on are studies involving dolphin progagation, coastal dune and dredge spoil stabilization, insect pest management in coastal and estuarine areas, optimal ecological designs for estuarine systems, dynamics of flow in estuarine waters and marine resources legal research. In addition to the study of the marine environment, the Sea Grant programs train scientists and technicians in the special problems of coastal North Carolina. (Ritchie-Florida)
W75-01348

MASS BALANCE AND ECONOMIC MODELS,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W75-01388

PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN SOUTH-CENTRAL MINNESOTA.
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 500, $3.25 in paper copy, $2.25 in microfiche. November 1973, 12 p. OWRT A-028-MINN(7). 14-31-0001-4023.

Descriptors: *Water resources, Research, *Minnesota, Conferences, Research priorities, Comprehensive planning, Projects, Project planning, State governments, Local governments.

The Water Resources Research Center, University of Minnesota, is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, Consultants, University of Minnesota, State and private Colleges, Interest Groups, and citizens. An attempt is being made to formulate broad research guidelines by inventorying research needs and assigning priorities. The object of this Forum was to identify research needs and priorities for southcentral Minnesota. Forum participants identified the following high priority needed water resources research topics: improving water resources information dissemination programs, integration of local, regional, State and Federal water resources programs, and determining the economic value of environmental assets. (Walton-Minnesota)
W75-01389

PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN NORTHWESTERN MINNESOTA.
Minnesota Univ., St. Paul. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-237 503, $3.25 in paper copy, $2.25 in microfiche. November 1973, 22 p. OWRT A-028-MINN(8). 14-31-0001-4023.

Descriptors: *Water resources, *Minnesota, *Research priorities, Research, Projects, *Project planning, *Conferences, Comprehensive planning, State governments, Local governments.

The Water Resources Research Center, University of Minnesota, is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, Consultants, University of Minnesota, State and private Colleges, Interest Groups, and citizens. An attempt is being made to formulate broad research guidelines by inventorying research needs and assigning priorities. The object of this Workshop Conference was to identify research needs and priorities in Northwestern Minnesota. Conference participants identified the following high priority needed water resources research topics: methods for improving the management of groundwater resources; techniques for integrating various water resources management programs on a regional and statewide basis; institutional arrangements for improving the coordination of water resources agencies and programs, and the communication between professionals and professionals and citizens; developing regional and a statewide water information system; innovative methods for improving sewage disposal systems; and ways and means for accelerating water quality management programs. (Walton-Minnesota)
W75-01390

EFFECT OF CHANGING WATER QUALITY AND SUPPLY ON IMPERIAL VALLEY, CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W75-01397

A DESCRIPTION OF THE SOUTHEASTERN KISSIMMEE-EVERGLADES DRAINAGE BASIN WITH EMPHASIS ON HYDROLOGIC-ECONOMIC LINKAGES,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
C. H. Tuan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 686, $5.25 in paper copy, $2.25 in microfiche. Master's Thesis, 1973. 114 p, 12 fig, 25 tab, 3 append. OWRR B-007-FLA(8). 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, *Decision making, *Florida, *Model studies, Regional analysis, Watersheds(Basins), Drainage area, Lakes.
Identifiers: Lake Okeechobee(Fla), Kissimmee Everglades drainage basin(Fla), *Economic models.

The purpose is to provide information useful for making water management decisions. Specifically, the goal is to formulate a descriptive model of the hydrologic features of the study area and to specify the linkages between the hydrology of the region and the economy of the region. A monthly water budget analysis will provide greater understanding of the effects on activities in the study area brought about by water control procedures. To develop this model, two sub-models, hydrologic and economic, were developed. The study area was divided into Lake Okeechobee and three sub-regions based on the characteristics of the region. The hydrologic sub-model shows that there were average annual net losses of water for the years 1968-1970 for Lake Okeechobee and Sub-region II, but net gains of water for Sub-regions I and III. The water consumed by crops in Sub-regions I and III amounted to an average of 1.80 and 0.71 million acre-feet annually. The net returns to water

withdrawn were approximately 160.24, 12.54, 50.09, and 58.73 million dollars per year for Lake Okeechobee, Sub-regions I, II, and III, respectively. (Morgan-Florida)
W75-01403

WATER FOR THE HUMAN ENVIRONMENT, VOLUME 1, CONGRESS PAPERS.
International Water Resources Association, Champaign, Ill.
Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Business Office, 425 Illinois Building, Champaign, Illinois. 449 p.

Descriptors: *Water resources, *Conferences, *Planning, *Environment, *Water quality, *Water pollution effects, *Water resources development, Water pollution control, Water pollution sources, Water management(Applied), Groundwater, Hydrology, International law, International waters, Environmental effects.
Identifiers: *Human environment, Developing countries.

Water for the human environment was discussed at a congress held at Chicago in 1973. The five broad topics discussed in Volume 1 were: (1) Worldwide problems relating to water, (2) Administrative coordination in international cooperation, (3) Technical coordination in international cooperation, (4) Innovative approaches for planning and management, and (5) New technology for solving water problems. Subject areas discussed included water resources management, water resources planning, water resources problems, water quality, socio-economic problems, environmental aspects, groundwater development and management, water pollution control, interbasin transfer of water, and water resources development. (See W75-01429 thru W75-01471) (Humphreys-ISWS)
W75-01428

GLOBAL ACTION FOR MAN'S WATER RESOURCES,
For primary bibliographic entry see Field 6F.
W75-01429

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
For primary bibliographic entry see Field 4A.
W75-01430

THE CONSEQUENCES OF BUILDING DAMS ON THE ENVIRONMENT,
For primary bibliographic entry see Field 6G.
W75-01431

WARMING OF THE WORLD'S WATERS BY MAN,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W75-01432

POSSIBLE FATE OF OIL IN THE ARCTIC BASIN,
Department of the Environment, Ottawa, (Ontario). Glaciology Div.
For primary bibliographic entry see Field 5B.
W75-01433

WATER MANAGEMENT PROBLEMS,
Agency for International Development, Washington, D.C.
For primary bibliographic entry see Field 6E.
W75-01434

COAL MINING AND ITS EFFECT ON WATER QUALITY,
Ohio Univ., Athens.
For primary bibliographic entry see Field 5B.
W75-01435

SOME WATER RESOURCES PROBLEMS AND HUMAN ENVIRONMENT,
Haryana Public Works Dept., Chandigarh (India), Irrigation Works.
For primary bibliographic entry see Field 4A.
W75-01436

SOCIO-ECONOMIC PROBLEMS IN WATER RESOURCES DEVELOPMENT AND APPROACHES TO THEIR SOLUTIONS,
Technical Univ. of Prague (Czechoslovakia).
M. Holy, and J. Riha.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 102-109, 3 tab, 9 ref.

Descriptors: *Planning, *Water resources development, *Economics, *Decision making, *Environment, Social aspects, Social function, Attitudes, Aesthetics, Social needs, Social values, Recreation, Rural sociology, Urban sociology, Management, Evaluation.

The utilization of water resources requires the distribution of water with the maximum optimal effect for human society. In this task, economic and socio-economic aspects should be taken into consideration. For evaluation of complex water management systems, criteria based on economic as well as social aspects has to be established. A general decision making process was presented which makes it possible to draw up projects of the utilization of water resources, bearing in mind all possible consequences. It takes into consideration economic aspects as well as extra-economic factors. (See also W75-01428) (Humphreys-ISWS)
W75-01437

THE WORLD ENVIRONMENT AND RESOURCES COUNCIL--TOWARD A PLANETARY ENVIRONMENTAL ORDER,
United States Environment and Resources Council, Villanova, Pa.
For primary bibliographic entry see Field 6E.
W75-01438

INTERNATIONAL COOPERATION IN DEVELOPING WATER RESOURCES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 6E.
W75-01439

ORGANIZATIONAL BASIS OF INTERNATIONAL CO-OPERATION IN DEVELOPMENT OF WATER RESOURCES AND QUALITY OF HUMAN ENVIRONMENT,
For primary bibliographic entry see Field 6E.
W75-01440

SOME POSSIBILITIES FOR INTERNATIONAL DEVELOPMENT OF THE GANGES-BRAHMAPUTRA RIVER BASINS,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 154-163. 1 tab, 6 ref.

Descriptors: *Water resources development, *Hydrologic aspects, *Water resources, Planning, Land development, Groundwater recharge, River basin development, Resources development, Irrigation water, Economics.
Identifiers: *Ganges-Brahmaputra River basins.

If the regional water table in the vicinity of the Ganges River system could be lowered 20-50 feet at the beginning of the monsoon season by means of large well fields, recharge of about 50 million acre feet of monsoon flow could be induced by seepage from the river system. This should provide irrigation water for 25 million net irrigated acres or a gross cropped area of 40 million acres (including rainfall infiltration). The total pumping capacity is estimated at 250,000 cusecs with a gross power requirement of 3300 megawatts. The annual costs of the scheme are estimated at $15-$20 per gross irrigated acre with a net benefit of $80-$85 per acre. Surface storage possibilities for regulating river flow are estimated to be at most 15 million acre feet. Groundwater supplies will be increased by approximately 15 million acre feet through bunding, which will induce greater infiltration of monsoon precipitation. (See also W75-01428) (Humphreys-ISWS)
W75-01441

DEVELOPMENT OF INTERNATIONAL WATER LAW IN THE LAKE CHAD BASIN,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 6E.
W75-01442

REGIONAL SYSTEMS AND HYDRAULIC GRIDS,
Tahal Consulting Engineers Ltd., Tel Aviv, Israel.
For primary bibliographic entry see Field 6A.
W75-01443

ENVIRONMENTAL PLANNING OF AN IRRIGATION PROJECT IN A DEVELOPING COUNTRY,
Kerala Public Works Dept., Trivandrum (India).
For primary bibliographic entry see Field 3F.
W75-01444

THE RECREATION BENEFIT OF THE PA MONG PROJECT,
National Energy Authority, Bangkok (Thailand).
P. Sutabutr.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 187-196. 1 fig, 8 tab.

Descriptors: *Water resources development, *Recreation, *Recreation demand, *Planning, Reservoirs, Dams, Economics, Population, Water management(Applied), Annual benefits.
Identifiers: *Thailand(Pa Mong Dam).

Recreational demand and benefit at Pa Mong Dam site and reservoir were estimated. Basic assumptions were: (1) tastes, attitude, and recreational demand of visitors is confined to sightseeing, camping, and picnicking; (2) rate of population growth is the same as that estimated by the National Economic Development Board; (3) rate of visitors would be same as to existing Ubolratana Dam and reservoir; (4) no competition for recreation from any nearby dams; (5) nothing will occur to drastically effect recreational visits; and (6) overall economic conditions will improve after dam is completed. Analysis of data for Ubolratana Dam indicated that for about a 200 km distance the number of visits per 1000 population was essentially inversely proportional to the distance between the populated area and the dam. For larger distances the visits per 1000 population were

constant. Tabulated results showed that from 1975-2020 for Pa Mong Dam and reservoir the estimated annual visitation will increase 390% and annual recreational benefit will increase 350%. (See also W75-01428) (Humphreys-ISWS)
W75-01445

THE INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH,
For primary bibliographic entry see Field 5G.
W75-01446

FUNCTION AND WORK OF FAO IN THE FIELD OF INTERNATIONAL COOPERATION IN DEVELOPMENT OF WATER RESOURCES FOR PRESERVATION OF THE HUMAN ENVIRONMENT,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 3F.
W75-01447

INTERNATIONAL COOPERATION IN CUNENE RIVER PROJECT ENVIRONMENTAL ASPECTS,
For primary bibliographic entry see Field 6E.
W75-01448

WORLD METEOROLOGICAL ORGANIZATION ACTIVITIES IN CENTRAL AMERICA,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 6E.
W75-01449

CONSIDERATIONS IN SELECTING WATER RESOURCES CONSULTING ENGINEERING FIRMS FOR DEVELOPING COUNTRIES,
BES Engineering Corp., Taipei, (Taiwan).
For primary bibliographic entry see Field 6E.
W75-01450

SOME TECHNIQUES ADAPTABLE FOR APPLICATION IN HYDROGEOLOGICAL INVESTIGATIONS IN CEYLON,
For primary bibliographic entry see Field 7B.
W75-01451

INTERBASIN TRANSFER OF WATER,
Malviya Regional Engineering Coll., Jaipur (India).
For primary bibliographic entry see Field 4A.
W75-01452

INTERNATIONAL INTERBASIN TRANSFER OF WATER--THE NAWAPA PROJECT,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-01453

INTEGRATED APPROACH TO WATER RESOURCES DEVELOPMENT IN WATER SCARCE COUNTRIES,
Ministry of Forest and Water Management, Prague (Czechoslovakia).
M. Jermar.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 270-278. 3 fig.

Descriptors: *Water resources development, *Decision making, *Planning, Methodology, Administration, Economics, Projections, Long-term planning, Management.

Projecting to the ultimate development stage technically imaginable on the basis of realistic development trends and not the economy of one single stage should be the key factor of the decision-making process in water development of water scarce countries. The rational coordination of development phases on the basis of long-term plans coordinated with other sectors and taking into account all factors including ecological and environmental creates the most economic approach from the long-range point of view. (See also W75-01428) (Humphreys-ISWS)
W75-01454

INTEGRATED SURFACE-GROUND WATER DEVELOPMENT ON A REGIONAL BASIS--THE SAN ANTONIO, TEXAS STUDY,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 4B.
W75-01455

PLANNING FOR WATER RESOURCE MANAGEMENT,
Henningson, Durham, and Richardson, Inc., Omaha, Nebr.
R. R. Dague, and P. L. Davis.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 291-302. 1 fig, 1 tab, 2 ref.

Descriptors: *Management, *Planning, *Decision making, Environment, Water quality, Water pollution control, Land management, Alternative planning, Political constraints, Constraints, Alternative water use, Water utilization, Motivation.

Water is the most abundant resource on earth, yet there are shortages. The basic problems result from the nonuniformity of supplies and demands and from water pollution. Potential solutions lie in the areas of increasing supplies, decreasing demands, shifting supplies or demands, multiple use, and water pollution control. The final solution, water pollution control, offers the greatest potential for short-term gains in water supply. Man-centered sources of water pollution arise from the production-consumption cycle. Proper management of water resources, both their quality and quantity, requires the development and execution of plans. Planning deals with the evaluation of alternative actions leading to desirable results. In evaluating alternatives, consideration must be given to physical, social, economic, political, managerial, and operational constraints. The best plan for one region may be the worst plan for another. Each plan must be unique. Some fundamental concepts of concern in water resources management were presented, and the role of planning in arriving at solutions to water resources problems were discussed. (See also W75-01428) (Humphreys-ISWS)
W75-01456

GROUND WATER ASSESSMENT AND DEVELOPMENT IN DEVELOPING COUNTRIES,
Uttar Pradesh Irrigation Dept., Lucknow (India).
For primary bibliographic entry see Field 4B.
W75-01457

INDIAN NATIONAL WATER PLAN AND GRID,
Indian Inst. of Tech., New Delhi (India).
M. C. Chaturvedi.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 311-321. 4 fig, 1 tab, 7 ref.

Descriptors: *Water resources development, *Planning, *Water policy, *Comprehensive planning, Inter-basin transfers, Water transfer, River basins, Surface waters, Social aspects, Economics, Hydrologic aspects, Physiographic provinces, Human population.
Identifiers: India(National Water Plan).

New concepts and techniques are being adopted in India to develop water resources to meet the long term needs for balanced economic growth. Legal framework and institutional structure are being modified. Comprehensive development of certain regions is being carried out using systems analysis. Interlinkage of basins is being examined. An overview of the scene and the relevant issues was presented with emphasis on proposed systems approach. (See also W75-01428) (Humphreys-ISWS)
W75-01458

WATER RESOURCES MANAGEMENT IN COASTAL PLAIN AQUIFERS,
Wisconsin Univ., Oshkosh.
For primary bibliographic entry see Field 4B.
W75-01459

FLOODS AS A SUPPLYING FACTOR FOR WATER RESOURCES,
Padua Univ. (Italy).
For primary bibliographic entry see Field 4A.
W75-01460

INTERDISCIPLINARY STUDY OF LAKE POWELL, USA: CONSEQUENCES OF WATER MANAGEMENT DECISIONS IN AN ARID REGION,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2H.
W75-01461

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-01462

APPLICATION OF GROUNDWATER MEASUREMENTS BY MEANS OF RADIOISOTOPES ON GROUNDWATER EXPLORATION,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 4B.
W75-01463

BERMUDA TUNNELS FOR FRESH WATER,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 4B.
W75-01464

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-01465

SEA PROTECTION AGAINST CONTAMINATION WITH OIL-CONTAINING WASTE WATER,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
For primary bibliographic entry see Field 5D.
W75-01466

THE METHOD OF REDUCTION OF SEWAGE DISCHARGE INTO THE SEA,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Baku (USSR).
For primary bibliographic entry see Field 5D.
W75-01467

OIL AND HAZARDOUS SUBSTANCE POLLUTION CONTROL ON THE OPEN SEA,
Northrop Services, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W75-01468

A WATER STORAGE METHOD BASED ON HUMAN ENVIRONMENT,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 3B.
W75-01469

SOIL-CEMENT FOR WATER CONTROL STRUCTURES,
Portland Cement Association, Skokie, Ill. Water Resources Dept.
For primary bibliographic entry see Field 8F.
W75-01470

AQUA-SANS SEWAGE TREATMENT SYSTEM,
Chrysler Corp., New Orleans, La. Space Div.
For primary bibliographic entry see Field 5D.
W75-01471

SNOW LOAD ANALYSIS AND RECREATIONAL USES OF SNOW DATA,
Soil Conservation Service, Reno, Nev.
For primary bibliographic entry see Field 2C.
W75-01523

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFLUENT CHARGES, INFORMATION GENERATION AND BARGAINING BEHAVIOR,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5G.
W75-01131

FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA,
Smith (Wilbur) and Associates, Denver, Colo.
For primary bibliographic entry see Field 5G.
W75-01289

ECONOMIC EFFECTS OF MERCURY POLLUTION ON COMMERCIAL FISHING AND RECREATION-RELATED BUSINESS ON PICKWICK LAKE IN ALABAMA,
Auburn Univ., Ala. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-01317

EFFECTS OF WASTEWATER SURCHARGES,
West Virginia Univ., Morgantown. Dept. of Management.
For primary bibliographic entry see Field 5G.
W75-01330

AN ALTERNATIVE APPROACH FOR DERIVING PRODUCTION AND COST FUNCTIONS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W75-01338

SURVEY OF PULP AND PAPER INDUSTRY ENVIRONMENTAL PROTECTION EXPENDITURES AND OPERATING COSTS -- 1973,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-01380

ECONOMICS OF WASTEWATER TREATMENT: THE ROLE OF REGRESSION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W75-01405

A BARGAINING APPROACH FOR PROGRAMMING LEAST-COST WASTE TREATMENT LEVELS ALONG A RIVER,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 5D.
W75-01407

INVESTIGATION OF THE OPTIMAL LIFE OF FIXED CAPITAL IN WATER SUPPLY AND SEWER SYSTEMS (AZ ALLOESZKOZOK OPTIMALIS ELETTARTAMANAK VIZSGALATA A VIZELLATAS ES CSATORNAZAS TERULETEN),
For primary bibliographic entry see Field 8A.
W75-01630

6D. Water Demand

THE DELAWARE VALLEY PLAN.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.
March 1970. 45 p, 24 fig.

Descriptors: *Water supply, *Waste water(Pollution), *Regional development, *Planning, *Water pollution control, *Delaware River, Pennsylvania, New Jersey, Comprehensive planning, Delaware River Basin Commission, Recreation, Sewers, Sewerage, Waste water treatment, Treatment facilities.
Identifiers: *Open space.

The Delaware Valley Regional Planning Commission is composed of nine counties located in two states: Chester, Montgomery, Philadelphia, Delaware, and Bucks counties in Pennsylvania and Gloucester, Camden, Burlington, and Mercer counties in New Jersey. On December 17, 1969, all state, county, and municipal governments concerned adopted a comprehensive regional development plan. This 15-year plan provides regional guidelines for the investment of 5 billion dollars for the development of public facilities to accomodate the expected population increase of approximately 1 1/2 million people in the area by 1985, and to preserve and protect the environment. There are six major proposals in the plan. One of these is to expand water distribution and transmission mains to areas where new development is planned and expected. These new facilities would serve 672,000 people by 1975, and an additional 879,000 by 1985. The water pollution control plan recommends extending the public sewer system to serve an additional 1,028,000 people and to cover an additional 666 square miles by 1975. Another 1,027,000 people are to be similarly serviced over an area of 363 square miles by 1985. Another proposal points out the need for providing open space in urban areas. Features of the landscape are instrumental in preserving an ecological balance. They, especially, need to be protected from urban development. Such features include the flood plains of the region's principal rivers and streams as well as the wetlands, marshes, aquifers, forests, and steep slopes lying within their watersheds. (Poertner)
W75-01137

REGIONAL WATER FACILITIES STUDY FOR UPPER VALLEY PLANNING AND DEVELOPMENT COUNCIL, LEBANON, NEW HAMPSHIRE.
Anderson-Nichols and Co., Inc., Concord, N.H.
Upper Valley Planning and Development Council, Lebanon, New Hampshire, June 1973. 63 p, 17 fig, 3 tab, 27 ref. CPA-NH-01-36-1003.

Descriptors: *Water supply development, *Municipal water, *Regional development, *Planning, *New Hampshire, *Vermont, Regional analysis, Urbanization, Long-term planning, Water treatment, Water delivery, Water supply.

The study area is located in the west central section of New Hampshire and the east central section of Vermont. It is known for its scenic lakes and ponds, and impressive mountains. The Upper Valley Region is made up of 13 towns, 3 in Vermont and 10 in New Hampshire. the following recommendations are made concerning the water facilities systems for the Upper Valley Region: (1) each community within the Upper Valley should proceed with plans for following the guidelines for regional water facilities systems as proposed in Scheme C of this Report; (2) construction should be undertaken as soon as possible to abandon all untreated surface water supplies within the Upper Valley Region; and (3) communities recommended to join together for water facilities should meet and form agreements such as recommended under 'Regional Administration'. Communities should also: (a) secure the services of a consulting engineer; (b) authorize its consulting engineer to prepare preliminary designs and final designs for the system; (c) obtain authorization for appropriation of funds and float bond issues as required to cover the project costs; (d) during the final planning period, apply for all federal grants programs for financial assistance; and (e) advertise, obtain bids, and award contracts for construction of the water facilities. It is also recommended that each community take the following actions: each community work with the Upper Valley Planning and Development Council in the preparation of zoning and land use plans in accordance with the regional land use plan to ensure the orderly growth and development of the Upper Valley Region. (Poertner)
W75-01148

PERSISTENCE OF HIGH DAILY DEMANDS IN AUSTRALIAN WATER SUPPLY SYSTEMS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
B. W. Gould.
Water (Journal of the Australian Water and Wastewater Association) Vol 1, No 3, p 20-22, September 1974. 3 fig, 2 ref.

Descriptors: *Variability, *Water demand, *Cities, *Australia, Estimating equations, *Water supply, Water distribution(Applied), Project planning, Design data, Storage requirements, Persistence, Distribution systems.
Identifiers: *Goodrich equation.

Statistics of the variability of the magnitude and persistence of peak flows were collected for a number of Australian towns, and compared with the Goodrich formula, which implies a constant ratio between peak day flow and average annual flow, and a constant persistence regardless of location. The results emphasize the variability of peak flow patterns over the continent, and locally with degree of industrialization or seasonal tourist development. The cost and trouble of collecting and analyzing local data may well be justified by efficiencies in planning combinations of trunk mains and storages. (CSIRO)
W75-01246

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
C. R. Weeks, and T. A. McMahon.

Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 58 - 66, 1974. 6 fig, 10 tab, 41 ref, append.

Descriptors: *Water utilisation, *Cities, *Australia, Consumptive use, Water demand, Water supply, Industrial water, Domestic water, Human population, Water quality, Monthly, Surveys, Forecasting.
Identifiers: *Melbourne(Vic).

Results of a survey of urban water use in Australia are presented. Factors influencing annual water use are examined; these include population size, metering, water quality and climate. Using trend extrapolation, water demands in 1985 are predicted for 11 Australian cities. Monthly consumption is related to climatic variables through multivariate analysis. Results from five small study areas in Melbourne, Geelong and Yallourn, Victoria, are used to detail characteristics of household and garden water usage. Characteristics of Melbourne industrial water use are discussed; and water use per unit of production for 29 processes is tabulated. (CSIRO)
W75-01254

6E. Water Law and Institutions

ORGANIZATIONAL EVALUATION OF INDUSTRIAL WATER POLLUTION CONTROL IN THE NEW YORK REGION,
New York Univ., N.Y. Graduate School of Public Administration.
For primary bibliographic entry see Field 5G.
W75-01129

WATER AND WASTEWATER--SUMMARY OF A PLAN FOR WATER-SEWER DEVELOPMENT IN THE LAKE-PORTER REGION, INDIANA.
Lake-Porter County Regional Transportation and Planning Commission, Highland, Ind.
For primary bibliographic entry see Field 6B.
W75-01146

FINANCIAL AND INSTITUTIONAL ARRANGEMENTS FOR WASTEWATER MANAGEMENT - DENVER SMSA,
Smith (Wilbur) and Associates, Denver, Colo.
For primary bibliographic entry see Field 5G.
W75-01289

THE FLOODING OF LAKE PEDDER, FINAL REPORT OF LAKE PEDDER COMMITTEE OF ENQUIRY, APRIL 1974.
Department of the Environment and Conservation, Canberra (Australia).
For primary bibliographic entry see Field 4A.
W75-01315

A CITIZEN'S GUIDE TO CLEAN WATER.
Izaak Walton League of America, Arlington, Va.
For primary bibliographic entry see Field 5G.
W75-01339

STATUS REPORT ON THE WATER LEVELS OF THE GREAT LAKES.
Hearing--Subcomm on Water Resources, Comm on Public Works, US House of Representatives, 93d Cong, 1st Sess, December 12, 1973. 44 p.

Descriptors: *Water levels, *International Joint Commission, *Great Lakes, *Flood protection, Regulation, Public health, Safety, Water resources, Precipitation(Atmospheric), Data collection, Drawdown, Fluctuation, High water mark, Low flow, Erosion, Flooding, Water distribution(Applied), Water policy, Planning.
Identifiers: Congressional hearings.

The high water levels of the Great Lakes and associated problems were discussed. Progress made by the Great Lakes Water Level Board in its study of the high water levels was described. The Corps of Engineers also presented testimony on the effectiveness of its emergency relief program in the Great Lakes area. Congressional Representatives and representatives of the International Joint Commission, United States and Canada also offered testimony. Portions of the testimony considered a proposal to hold the levels of Lake Superior and of Lakes Michigan-Huron in some sort of ratio, so that the middle and lower lakes will not have to bear the entire brunt. The difficulty with this plan is that the level of Lake Superior might surpass that provided for in the Boundary Water Treaty between the United States and Canada. (Sperling-Florida)
W75-01340

FLOOD INSURANCE AND DISASTER ASSISTANCE.
For primary bibliographic entry see Field 6F.
W75-01341

GEOTHERMAL RESOURCES.
For primary bibliographic entry see Field 4B.
W75-01342

RESOURCE CONSERVATION AND RECYCLING, (PARTS I AND II).
For primary bibliographic entry see Field 6G.
W75-01343

CONGRESSIONAL INTENT OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT,
Committee on Public Works (U.S. House).
For primary bibliographic entry see Field 5G.
W75-01345

THE LATIN AMERICAN APPROACH TO THE LAW OF THE SEA,
North Carolina Univ., Chapel Hill. School of Law.
J. H. Samet, and R. L. Fuerst.
Sea Grant Publication UNC-SG-73-08, March, 1973. 166 p, 466 ref, 7 append.

Descriptors: *Law of the sea, *International law, *Treaties, *Oceans, *Jurisdiction, *South America, Coasts, Beds, Natural resources, Legal aspects, United Nations, Water law, Navigation, International waters, Foreign waters, Water policy, Resources development, Continental shelf, Governments, Commercial fishing, Exploitation.

Presented are the philosophy and historical development of Latin American claims to two hundred mile territorial waters; the specific individual views and laws of most of these nations regarding the exercise of jurisdiction in the patrimonial sea areas contiguous to their coasts; and a detailed examination of off-shore mineral and living marine resources. An evaluation is included of the impact of Latin American legal thought and action upon the evolving law of the sea and probable influences upon the 1973 and 1974 United Nations Law of Conferences. Various state, national and international statutes, decrees, pronouncements, treaties and conventions regarding the law of the sea and marine resources are included. (Ritchie-Florida)
W75-01346

THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION: ITS CAPACITY TO IMPLEMENT AN INTERNATIONAL DECADE OF OCEAN EXPLORATION,
Rhode Island Univ., Kingston. Law of the Sea Inst.
M. E. Galey.
Occasional Paper Series, Occasional Paper No. 20, December 1973. 39 p, 137 ref.

Descriptors: *Oceans, *Natural resources, *Data collections, *Exploration, Water resources, Water resources development, International commissions, Law of the sea, Environment, Coasts, Marine biology, Beds, Planning, Oceanography, Sea water, Hydrologic aspects, Water sources, Water pollution, Resources development, Mineralogy, Fisheries, Research and development, Grants.

The capacity of the Intergovernmental Oceanographic Commission (IOC) to implement the International Decade of Ocean Exploration (IDOE) is analyzed. The purposes of the IDOE are to preserve the ocean environment by accelerating scientific observations of the natural state of the ocean and its interactions with the coastal margin; to improve fundamental forecasting as to help reduce hazards to life and property and permit more efficient use of marine resources; to expand seabed assessment activities to permit better management; to develop an ocean monitoring system to facilitate prediction of oceanographic and atmospheric conditions; to improve world wide data exchange through modernizing and standardizing national and international marine data collection processing and distribution; and to accelerate planning to increase opportunities for international sharing of responsibilities and costs for ocean exploration. The legal competence, the structural capacity, the resource capacity, and the political capacity of the I0C to implement the IDOE, for the purpose of acquiring scientific information about the ocean regarding minerals, fishery production and marine pollution, are analyzed. (Ritchie-Florida)
W75-01349

PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN SOUTH-CENTRAL MINNESOTA.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-01389

PROCEEDINGS OF PUBLIC WORKSHOP CONFERENCE ON WATER RESOURCES PROBLEMS AND RESEARCH NEEDS IN NORTHWESTERN MINNESOTA.
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W75-01390

LEGAL RESEARCH, WRITING AND DRAFTING TOWARD IMPROVING MONTANA WATER LAWS: JULY 1, 1968 TO JUNE 30, 1971,
Montana Univ., Missoula. School of Law.
A. W. Stone.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 673, $5.25 in paper copy, $2.25 in microfiche. Completion Report, Montana University, Joint Water Resources Research Center, Bozeman, December 1973, 199 p. OWRT A-031-MONT(3).

Descriptors: *Water law, *Water rights, *State jurisdiction, *Water allocation(Policy), *Montana, Legal aspects, Legislation, Documentation.
Identifiers: Legal writing, Legal research.

This report consists of a compilation of writings by the author during a 3-year period in which he served as a consultant to the Montana Legislative Council, Chairman of the Drafting Committee for the Montana Conservation Council for Water Conservancy District Legislation, consultant to and draftsman for the Water Use Priorities Committee of the Montana House of Representatives, and member of and participant in a Water Law Seminar for federal and state personnel. These writings are intended to support a project which

will propose a complete overhauling of Montana's water rights laws, in the form of a drafted recodification. The Montana Legislative Council, acting pursuant to Senate Joint Resolution No. 13 of the 1965 legislature, is preparing a draft of a Water Conservancy District Act to facilitate the financing and development of multipurpose projects for the use of water. (Williams-Montana State)
W75-01406

WATER FOR THE HUMAN ENVIRONMENT, VOLUME 1, CONGRESS PAPERS.
International Water Resources Association, Champaign, Ill.
For primary bibliographic entry see Field 6B.
W75-01428

WATER MANAGEMENT PROBLEMS,
Agency for International Development, Washington, D.C.
A. A. Bishop.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 71-80, 12 ref.

Descriptors: *Water management(Applied), *Water resources, *Administration, *Institutions, *Water users, Planning, Agriculture, Governments, Management, Federal government, State governments, Environment, Local governments, Irrigation systems.
Identifiers: *International water management.

Water management was defined as the space-time-quantity-quality alteration of the water resource in and between various water uses to meet societal goals. Five levels of water management decisions briefly outlined were: international, national, state, local, and user. Fifteen major uses of water were listed, and problems and conflicts between uses were categorized. A concept for on-farm water management was presented, and the problems of water management for agriculture were discussed with reference to the physical and institutional components of an irrigation system. Management of the water resource requires careful planning to guarantee that the water is not automatically locked into the wrong decisions, but guided into the right ones. (See also W75-01428) (Humphreys-ISWS)
W75-01434

THE WORLD ENVIRONMENT AND RESOURCES COUNCIL--TOWARD A PLANETARY ENVIRONMENTAL ORDER,
United States Environment and Resources Council, Villanova, Pa.
H. C. Wohlers, E. A. Wolff, and H. Chestnut.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 113-124, 6 fig, 4 tab, 1 ref.

Descriptors: *Organizations, *Environment, *Planning, Natural resources, Administration.
Identifiers: World Environment and Resources Council, US Environment and Resources Council.

An environmental crisis may be in the making involving earth's delicate, intertwined, and remarkably intricate life-support system of air, land, and water. To discuss, evaluate, and help make decisions affecting earth's environment and resources, a World Environment and Resources Council was formed. This council is comprised of twelve separate national organizations. For the organization to continue to fulfill its objectives, it requires the active support of all scientific and non-scientific people. Positive action by all concerned must be taken to decide the manner in which man and nature should coexist in the future. (See also W75-01428) (Humphreys-ISWS)
W75-01438

INTERNATIONAL COOPERATION IN DEVELOPING WATER RESOURCES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
G. N. Thorsky.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 125-144, 34 fig.

Descriptors: *Training, *Management, *Planning, *Water resources development, Water management(Applied), Education, Scientific personnel, Engineering education, Administration, Governments.
Identifiers: International cooperation.

The Bureau of Reclamation has been carrying out the responsibility of sharing its knowledge and experience in water resource management since 1920. This sharing has taken the form of sending technical teams abroad to help with planning and development of water resource projects and inviting other countries to send their people to the United States for both short- and long-term training and observation. International exchange programs of technical literature have been instituted with many countries. This international cooperation has and is being carried out as a supplement to Bureau of Reclamation domestic operations with activities both here and abroad authorized by the United States Congress. (See also W75-01428) (Humphreys-ISWS)
W75-01439

ORGANIZATIONAL BASIS OF INTERNATIONAL CO-OPERATION IN DEVELOPMENT OF WATER RESOURCES AND QUALITY OF HUMAN ENVIRONMENT,
A. Kepinski.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 145-153, 4 ref.

Descriptors: *United Nations, *Water resources development, *Organizations, Water resources, Environment, Water quality, International commissions, Foreign countries, Governments, Natural resources, Planning, Administration, Institutions.
Identifiers: *Human environment.

The activities of international organizations in the fields of water resources and human environment were described, to emphasize the existing international co-operation, to accentuate the interdisciplinary character of water resources development, and to stress the need for co-ordination of activities. Necessity for an integration of activities and for intensification of interorganizational co-operative relations of competent international organizations was particularly emphasized. There is a close interdependence of the fields of water resources and human environment. The problems of water resources development and environmental health are becoming constantly more serious with rapid technological change, accelerated population growth, and greater concentration of people into urban centers. Governments are faced with the need for development of water resources and quality of human environment in their countries, and especially in developing countries. In order to solve and to accelerate the development many agencies, institutions and individuals are engaged in these fields. The specialized international organizations are the forum for co-operation and for exchange of experience and ideas at the international level. (See also W75-01428) (Humphreys-ISWS)
W75-01440

SOME POSSIBILITIES FOR INTERNATIONAL DEVELOPMENT OF THE GANGES-BRAHMAPUTRA RIVER BASINS,
Harvard Univ., Cambridge, Mass. Center for Population Studies.
For primary bibliographic entry see Field 6B.
W75-01441

DEVELOPMENT OF INTERNATIONAL WATER LAW IN THE LAKE CHAD BASIN,
Food and Agriculture Organization of the United Nations, Rome (Italy).
P. H. Sand.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 164-173. 23 ref.

Descriptors: *International law, *International waters, *Water resources, *Treaties, United Nations, Administration, Water allocation(Policy), Economics, Hydrology, Ecology, Legal aspects, Water law, Water management(Applied).
Identifiers: *Africa(Lake Chad Basin).

After a survey of the natural and human environment fo Africa's Lake Chad Basin, the evolution of international legal regulation for the basin's water resources was described, from colonial boundary treaties to the current work of the quadri-partite Lake Chad Basin Commission established by a treaty between Cameroon, Chad, Niger, and Nigeria, with special emphasis on a recent draft agreement on water utilization and conservation. (See also W75-01428) (Humphreys-ISWS)
W75-01442

ENVIRONMENTAL PLANNING OF AN IRRIGATION PROJECT IN A DEVELOPING COUNTRY,
Kerala Public Works Dept., Trivandrum (India).
For primary bibliographic entry see Field 3F.
W75-01444

THE INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH,
For primary bibliographic entry see Field 5G.
W75-01446

INTERNATIONAL COOPERATION IN CUNENE RIVER PROJECT ENVIRONMENTAL ASPECTS,
C. Q. Gois.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28 1973. International Water Resources Association, Champaign, Illinois, p 216-223. 2 fig.

Descriptors: *Water resources development, *Treaties, *Planning, *International waters, *Environment, Rural areas, Agriculture, Land use, Social aspects, River basin development, Rivers, Watersheds(Basins), Foreign countries.
Identifiers: *Cunene River, *Angola, *South Africa.

Flowing in a semi-arid region, Cunene River is a precious source of water for the satisfaction of direct and indirect human needs. Its international character required cooperation with the Republic of South Africa. An agreement establishing the basis for the best joint utilization of the water resources of international rivers in general was signed between Portugal and South Africa, Fol-

lowed in 1969 by a special agreement on the Cunene. Technical groups of both countries have worked in close cooperation, in order to obtain a general plan for the best joint use of the water resources. As a result of topographic, soil, and climate conditions, the basin can be subdivided into three main zones: (1) Upper, (2) Middle, and (3) Lower Cunene. Zone 1 comprises a set of schemes for regulation of flows and power production; zone 2 is an area of large irrigation and cattle grazing schemes; zone 3, corresponding more or less to the international course, is devoted to power production with large dams and falls using water regulated upstream. Among the envisaged schemes, the water supply to men and cattle together with the regeneration of natural pasturages and an intensive program of social and economical improvement play an important role and are the basis of the general development of the area. A joint process by specialized teams, from preliminary phases to operation of the schemes, helps to obtain the best benefits from the water for the promotion of the human environment. (See also W75-01428) (Humphreys-ISWS)
W75-01448

WORLD METEOROLOGICAL ORGANIZATION ACTIVITIES IN CENTRAL AMERICA,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
E. Basso.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 224-230. 2 fig, 5 ref.

Descriptors: *Water resources, *Training, *Organizations, *Foreign countries, Planning, Meteorology, Climatology, Hydrology, Institutions, Education, Governments, United Nations.
Identifiers: *Central America, World Meteorological Organization.

Until 1966 the meteorological and hydrological networks in Central America were almost nonexistent. This lack of basic meteorological and hydrological information has represented a serious problem for planning and evaluating water resources projects of the Central American Isthmus. Therefore, the governments of the six countries of the area requested technical assistance from the United Nations Development Program to help establish the needed hydrometerological projects. The World Meterological Organization took charge of the resulting projects. Since 1967, more than 350 hydrological stations and more than 950 meteorological stations have been installed; personnel have been trained by means of fellowships, seminars, courses, publications, and on-the-job training; meteorological and/or hydrological services have been strengthened; and data collected from both new and old stations have been published. All six countries participate in the World Weather Watch program. (See also W75-01428) (Humphreys-ISWS)
W75-01449

CONSIDERATIONS IN SELECTING WATER RESOURCES CONSULTING ENGINEERING FIRMS FOR DEVELOPING COUNTRIES,
BES Engineering Corp., Taipei, (Taiwan).
Y-M. Liu, and K-M. Yao.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 231-241. 1 tab.

Descriptors: *Water resources development, *Administrative decisions, *Administration, *Decision making, Management, Methodology, Planning, Coordination, Water resources.
Identifiers: *Consultant selection, Developing countries.

The problems that administrators in developing countries face in selecting a competent consulting engineering firm for large scale engineering projects were discussed. Administrators must answer questions about what they want the consultant to do, the extent of work to be performed, the allowable time to complete assignment, and the compensation for the consultant. Answers to these questions may require assistance that is not available in the developing country. Assuming that administrators may have reasonable answers to the above questions, they must determine criteria for screening and final selection of foreign consulting engineering firms in relation to the particular project. To assist the developing countries, it was recommended that: (1) international professional organizations or international agencies could maintain a data bank on information regarding consulting engineering firms in water resources fields and international water resources projects, and make these available to administrators of developing countries; and (2) a carefully prepared check list or marking scale could be prepared to help in the evaluation and final selection process. (See also W75-01428) (Humphreys-ISWS)
W75-01450

SOME TECHNIQUES ADAPTABLE FOR APPLICATION IN HYDROGEOLOGICAL INVESTIGATIONS IN CEYLON,
For primary bibliographic entry see Field 7B.
W75-01451

INTERNATIONAL INTERBASIN TRANSFER OF WATER--THE NAWAPA PROJECT,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-01453

INTEGRATED APPROACH TO WATER RESOURCES DEVELOPMENT IN WATER SCARCE COUNTRIES,
Ministry of Forest and Water Management, Prague (Czechoslovakia).
For primary bibliographic entry see Field 6B.
W75-01454

PLANNING FOR WATER RESOURCE MANAGEMENT,
Henningson, Durham, and Richardson, Inc., Omaha, Nebr.
For primary bibliographic entry see Field 6B.
W75-01456

GROUND WATER ASSESSMENT AND DEVELOPMENT IN DEVELOPING COUNTRIES,
Uttar Pradesh Irrigation Dept., Lucknow (India).
For primary bibliographic entry see Field 4B.
W75-01457

INDIAN NATIONAL WATER PLAN AND GRID,
Indian Inst. of Tech., New Delhi (India).
For primary bibliographic entry see Field 6B.
W75-01458

OIL AND HAZARDOUS SUBSTANCE POLLUTION CONTROL ON THE OPEN SEA,
Northrop Services, Inc., Arlington, Va.
For primary bibliographic entry see Field 5G.
W75-01468

A WATER STORAGE METHOD BASED ON HUMAN ENVIRONMENT,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 3B.
W75-01469

6F. Nonstructural Alternatives

REGION 'P', PHASE I WATER QUALITY MANAGEMENT PLAN,
Neuse River Council of Governments, New bern, N.C.
For primary bibliographic entry see Field 5G.
W75-01144

REGION 'P', PHASE II WATER QUALITY MANAGEMENT PLAN.
Neuse River Council of Governments, New Bern, N.C.
For primary bibliographic entry see Field 5G.
W75-01145

THE NORTHEAST MICHIGAN REGIONAL PLANNING HANDBOOK.
Northeast Michigan Regional Planning and Development Commission, Rogers City.
June 1973. 81 p, 44 fig, 35 tab. HUD P-336-371.

Descriptors: *Regional analysis, *Planning, *Comprehensive planning, *Michigan, *Environmental control, Water conservation, Environmental engineering, Shore protection, Wetlands, Lakes, Erosion control, Water pollution control, Lake Huron, Long-term planning, Regional development.
Identifiers: *Northeastern Michigan, Guidelines.

A regional planning handbook was prepared to serve as a guide for the development of eight counties in northeast Michigan. The counties included are: Alcona, Alpena, Cheboygan, Crawford, Montmorency, Oscoda, Otsego and Presque Isle. The plan provides an inventory and description of the region including the people, activities, services and environment. It also includes identification and discussion of the issues and the adopted goals and objectives of the Northeast Michigan Regional Planning and Development Commission. Short and long range regional development plans are provided to formalize the written goals and objectives and provide a general framework for future physical development. The report provides a general framework from which local decision-makers can develop local planning programs. Water resources are recognized in the publication as the most important, diverse and unique of the natural resources. Among the water related subjects included are: inland lakes, shorelines, Lake Huron, river basins, groundwater, flood plains and wetlands, and regional water quality. Many existing sewer systems and individual septic systems are inadequate or functioning improperly. Local requirements for improved sewage systems are often not met because of inadequate funding. The development plan includes guidelines that call for: preservation of flood plains and wetlands, regulation of the use and development of inland lakes and adjacent areas, adoption of erosion control measures to protect the shorelines along Lake Michigan and inland lakes, conservation of surface waters, and prevention of lake pollution from stock yard wastes and industrial and municipal wastes. (Poertner)
W75-01147

FLOOD HAZARDS IN VERMONT (A STRATEGY FOR ABATEMENT),
Vermont Dept. of Water Resources, Montpelier. Agency of Environmental Conservation.
For primary bibliographic entry see Field 4A.
W75-01290

FLOOD INSURANCE AND DISASTER ASSISTANCE.
Hearings-Subcomm on Housing and Urban Affairs, Comm on Banking, Housing and Urban Affairs, U.S. Senate, 93d Cong, 1st Sess, June 11-15, 1973. 432 p, 12 fig, 6 map, 3 chart.

Descriptors: *Legislation, *Federal government, *Floods, *Flood insurance, *Disasters, Flood plain zoning, Insurance, State governments, Planning, Non-structural alternatives, Flood control, Inter-agency cooperation, Flood damage, Flood plains, Flood protection, Government finance.

These hearings examined legislative proposals which fall into two major categories, flood insurance and disaster assistance. The principal legislative proposal relating to the national flood insurance program would substantially increase the limits of coverage and provide for the expeditious dissemination of information concerning flood-prone areas. It would also require participating states to adopt adequate flood plain ordinances to reduce or avoid future flood losses. Furthermore, the bill requires the purchase of flood insurance by property owners who are being assisted by federal programs in identified areas having special flood hazards. Another bill before the subcommittee was a measure recommended by the administration which deals with several areas of disaster relief assistance to state and local governments, homeowners, small businesses and others. The purpose of these hearings was to provide the necessary discussion of the federal role in times of major catastrophe, and to analyze methods of consolidating and coordinating various and diverse federal disaster activities. (Ritchie-Florida)
W75-01341

GLOBAL ACTION FOR MAN'S WATER RESOURCES,
C. A. Doxiadis.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 3-28, 8 fig, 3 tab, 19 ref.

Descriptors: *Planning, *Water resources, *Environment, *Zoning, Land use, Land resources, Water zoning.
Identifiers: *Global system, Human environment.

Three proposals were presented for facing problems of water for man on a global basis. First, to save water for man it was proposed that the entire globe be committed to 12 land zones: (1) real wildlife (40%); (2) wildlife visited (17%); (3) wildlife embraced (10%); (4) wildlife invaded (8%); (5) wildlife encouraged (7%); (6) natural agriculture (5.5%); (7) industrial agriculture (5%); (8) man's physical life (5%); (9) low density city (1.3%); (10) middle density city (0.7%); (11) high density city (0.3%); and (12) heavy industry and waste (0.2%). Second, it was proposed the globe be committed to 12 water area zones: (1) real virginity retained in lakes, rivers, and some sea harbors; (2) man enters as a primitive animal; (3) man can live in sailboats and fish; (4) special boats may carry people; (5) same as zone 4 with some harbors; (6) production zone for aquatic life; (7) lakes, rivers, and harbors for production of plant and animal life for man; (8) man allowed organized entertainment; (9) normal small ports with commerce and transportation added to entertainment; (10) larger ports and boats than those of zone 9; (11) very large ports for all boats, commerce, and industry; and (12) waste disposal. Third, clearly define the system of our life, which is expressed by Human Settlements, with a systematic approach. The intent of the proposals was to insert dimensions in all of man's decisions to make them work. (See also W75-01428) (Humphreys-ISWS)
W75-01429

6G. Ecologic Impact Of Water Development

INFORMATION GENERATION AND COMMUNICATION TO ESTABLISH ENVIRONMENTAL QUALITY OBJECTIVES,
British Columbia Univ., Vancouver. Westwater Research Centre.
I. K. Fox, and L. F. Wible.
Natural Resources Journal, Vol 13, No 1, p 134-149, January 1973. 17 ref. OWRT C-1228(No 1601)(12) and B-038-WIS(7). 14-01-001-1601 and 14-31-001-3352.

Descriptors: *Environment, *Environmental effects, *Environmental control, *Water quality standards, *Water quality, Water law, Water policy, Air pollution, Standards, Legislation, Regulation, Water pollution, Water pollution sources, Environmental sanitation, Environmental engineering, Planning, Project planning, Project benefits, Project feasibility.
Identifiers: Administrative regulations.

Some uses of natural resources have side effects which adversely alter the quality of the physical and biological environment; public action is necessary to weigh these effects and determine to what extent they are worthwhile in view of the social benefits derived from such uses. Four broad categories of public procedures are utilized for this purpose. The first category entails the evaluation of the consequences of individual actions at the time the action is proposed and determines whether the result will be Pareto optimal in view of the estimated effects upon environmental quality. A second category of procedures involves limiting or constraining certain kinds of activities that are viewed as adversely affecting environmental quality. A third category involves deciding upon the design of an environmental plan and requiring that future actions be consistent with that plan. The fourth category which is discussed in detail, is the statutory and administrative establishment of environmental water quality standards and then limiting activities so as to assure realization of the standards. (Ritchie-Florida)
W75-01130

CHEMISTRY,
Missouri Univ., Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-01230

A CURRICULUM ACTIVITIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES: ACTIVITIES, VOLUME 1.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For primary bibliographic entry see Field 6B.
W75-01314

GEOTHERMAL RESOURCES.
For primary bibliographic entry see Field 4B.
W75-01342

RESOURCE CONSERVATION AND RECYCLING, (PARTS I AND II).
Hearings--Subcomm on Environment, Comm on Commerce, U.S. Senate, 93d Cong, 1st Sess, June 11, 22 and July 18, 19, 20, 26, 1973. 860 p.

Descriptors: *Legislation, *Conservation, *Environment, *Natural resources, *Recycling, *Federal government, Pollution abatement, Environmental effects, Solid wastes, Effluents, Pollutants, Water pollution, Water pollution sources, Water pollution control, Waste disposal, Resources development, Resource allocation, Energy, Energy loss, Adoption of practices, Environmental control, Environmental sanitation.

Increased use of recycled materials is an environmental necessity. The amount of air, water and solid waste pollution resulting from production systems using recycled wastes is significantly lower than that of the effluent production systems that rely on virgin materials. The resource recovery bills before the subcommittee were based on the premise that maximum resource conservation will occur only when an economic environment has been created which penalizes the wasteful use of materials and encourages recycling. It was alleged that the Interstate Commerce Commission and Federal Maritime Commission unjustly discriminate against the recycling of solid waste materials. Provisions within these bills would require these agencies to investigate the freight rate structure and eliminate discriminatory rates. The bills would also require government agencies to purchase products containing recycled materials whenever available at a reasonable price. The hearings also focused on the proposed Resource Conservation and Recycling Act of 1973, which synthesized elements of various other legislative proposals. (Ritchie-Florida)
W75-01343

CHALMETTE PUBLIC HEARINGS TESTIMONY, (LOUISIANA).
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 4A.
W75-01344

HUNGRY HORSE CLOUD SEEDING PROGRAM (FINAL ENVIRONMENTAL STATEMENT).
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 3B.
W75-01347

ANNUAL REPORT JULY 1971 THROUGH DECEMBER 1972,
North Carolina Univ., Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 6B.
W75-01348

STRATIGRAPHY OF AN ARCHEOLOGICAL SITE, OCMULGEE FLOOD PLAIN, MACON, GEORGIA,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 2J.
W75-01365

THE CONSEQUENCES OF BUILDING DAMS ON THE ENVIRONMENT,
J. Toran.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 45-47.

Descriptors: *Dams, *Environment, *Planning, Water resources development, Environmental effects, Water quality, Regulation, Water resources.
Identifiers: *Human environment.

The problem of pollution demands earnest thought, as it is threatening to life. Water resources are the overwhelming problem of today and tomorrow. Dams are among the earliest and most basic tools of civilization and are the only solution to man's angst. Humanity is becoming aware that quality means something beyond quantity. When building dams, it is necessary to take into account the whole complex of climatic, eutrophic, and biotic factors that shall act upon an ecological community and ultimately determine its form and survival, together with the whole aggregate of social and cultural conditions. Dams bring water home, to industry and agriculture and

for recreation. The world must be convinced of the necessity of building dams with earnest and reasoned effort and desire to conserve and improve the environment. (See also W75-01428) (Humphreys-ISWS)
W75-01431

SOCIO-ECONOMIC PROBLEMS IN WATER RESOURCES DEVELOPMENT AND APPROACHES TO THEIR SOLUTIONS,
Technical Univ. of Prague (Czechoslovakia).
For primary bibliographic entry see Field 6B.
W75-01437

INTERDISCIPLINARY STUDY OF LAKE POWELL, USA: CONSEQUENCES OF WATER MANAGEMENT DECISIONS IN AN ARID REGION,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2H.
W75-01461

7. RESOURCES DATA

7A. Network Design

ON THE TRANSFORMATION OF POINT RAINFALL TO AREAL RAINFALL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-01125

BASIC DIFFICULTIES IN PREDICTING EVAPORATION,
Heidemaatschappij Beheer N.V., Arnhem (Netherlands). Research Dept.
For primary bibliographic entry see Field 2D.
W75-01300

7B. Data Acquition

DETERMINATION OF THE RADON CONTENT IN WATER BY A WIDELY USED INSTRUMENT, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Krivoi Rog (USSR).
For primary bibliographic entry see Field 5A.
W75-01153

RADIOTELEMETRY OF HYDROMETEROLOGICAL DATA,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
C. F. Hood, and L. F. Huggins.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 442, $3.25 in paper copy, $2.25 in microfiche. Mimeo Paper No. 73-5572 American Society of Agricultural Engineers, St. Joseph, Michigan, 1973. 11 p, 7 fig. OWRT A-027-IND(1).

Descriptors: *Telemetry, *Instrumentation, Weather data, Climatic data, *Meteorology, Air pollution, Monitoring, Pollutant identification, *Warning systems.

A low cost battery-operated system wherein hydrometerological data is transmitted by radiotelemetry from a remote site to a centralized recording station is described. Applications of such a data acquisition system are noted for early flood warning and pollution and traffic level monitoring.
W75-01214

A CRITICAL ANALYSIS OF WARBURG RESPIROMETRY FOR BOD DETERMINATIONS OF POLLUTED RIVERS,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5A.
W75-01217

AIR ENTRAPMENT AS A POSSIBLE SOURCE OF ERROR IN THE USE OF A CYLINDRICAL HEAT PROBE,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01232

THE SELF-DIFFUSION COEFFICIENTS OF 45CA AND 2,4-DICHLOROPHENOXYACETIC ACID,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2G.
W75-01233

APPLICATION OF TOTAL ORGANIC CARBON MEASUREMENTS AND CORRELATIONS WITH OXYGEN DEMAND PARAMETERS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
For primary bibliographic entry see Field 5A.
W75-01245

WATER AND WASTE FLOW MEASUREMENT,
Fischer and Porter Co., Warminster, Pa.
O. Soroko.
TAPPI (Atlanta, Ga.) Engineering Conference, Boston, Massachusetts, Tuesday Session, Oct. 9, 1973. (Preprinted Proceedings). p 187-203, 11 fig, 2 tab.

Descriptors: *Instrumentation, *Flow rates, *Flowmeters, *Waste water, *Monitoring, *Aquifer testing, Pipelines, Closed conduits, Aquifers, Flow, Measurement.

Sensing devices for measuring the flow rates of water and waste water streams are discussed. Meters for determining flows in open channels, closed full pipes, and partially closed conduits are reviewed. Installation and application requirements are listed, and the accuracies and measurement ranges of flow sensors are tabulated. The selection of signal transmission, recording, and control accessories is also indicated. (Witt-IPC)
W75-01262

AN EXAMPLE OF THE USE OF BACTERIOPHAGE AS A GROUNDWATER TRACER,
Halcrow (William) and Partners, London (England).
For primary bibliographic entry see Field 2F.
W75-01291

REMOTE SENSING AND SNOWPACK MANAGEMENT,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 2C.
W75-01294

AN ASSESSMENT OF REMOTE SENSING APPLICATIONS IN HYDROLOGIC ENGINEERING,
Hydrologic Engineering Center, Davis, Calif.
R. H. Burgy, and V. R. Algazi.
Research Note No. 4, September 1974. 55 p, 17 fig, 4 tab, 34 ref.

Descriptors: *Reviews, *Remote sensing, *Hydrologic data, Instrumentation, Exploration, Measurement, Surveys, Hydrologic aspects, Hydrology, Water resources, Watersheds(Basins), Radiation, Meteorology, Water quality.

The current status of techniques, limitations, and applications of remote sensing to hydrologic problems of rainfall estimation, snow cover monitoring, water quality monitoring, and hydrologic modeling and runoff computation was reviewed. Tabulated data for 29 remote sensors indicated for each sensor the resolution range, spectral interval, spacecraft or aircraft that sensor has or could be flown on, and the major hydrologic parameters that could be measured on inferred. The thirteen hydrologic parameters listed were: surface temperature, cloud cover, atmospheric liquid water content, snow cover, water equivalent of snowpack, vegetation, land use, soil moisture, short wave radiation in radiation budget, long wave radiation in radiation budget, water bodies configuration, soil types, and basin area. Each sensor was capable of measuring from one to nine of these parameters. The capability of remote sensing to gather regional scale synoptic information offers the potential of greatly enhancing watershed modeling. (Humphreys-ISWS)
W75-01312

MEASUREMENT OF SOIL MOISTURE BY USE OF THE LATENT HEAT OF VAPORIZATION,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2G.
W75-01334

OPTICAL DATA PROCESSING AND PROJECTED APPLICATIONS OF THE ERTS-1 IMAGERY COVERING THE 1973 MISSISSIPPI RIVER VALLEY FLOODS,
Geological Survey, Reston, Va. EROS Program Office.
M. Deutsch, and F. Ruggles.
Water Resources Bulletin, Vol 10, No 5, p 1023-1039, October 1974. 9 fig, 7 ref. USGS Contract 14-08-0001-13185.

Descriptors: *Floods, *Remote sensing, *Satellites(Artificial), *Mississippi River Basin, Mississippi River, Mapping, Flood plains, Infrared radiation.
Identifiers: *ERTS.

Flooding along the Mississippi River and some of its tributaries was detected by the multispectral scanner (MSS) on the Earth Resources Technology Satellite (ERTS-1) on at least three orbits during the spring of 1973. The ERTS data provided the first opportunity for mapping the regional extent of flooding at the time of the imagery. Special optical data processing techniques were used to produce a variety of multispectral color composites enhancing flood-plain details. One of these, a 2-color composite of near infrared bands 6 and 7, was enlarged and registered to 1:250,000-scale topographic maps and used as the basis for preparation of flood image maps. Two specially filtered 3-color composites of MSS bands 5, 6, and 7 and 4, 5, and 7 were prepared to aid in the interpretation of the data. The extent of the flooding was vividly depicted on a single image by 2-color temporal composites produced on the additive-color viewer using band 7 flood data superimposed on pre-flood band 7 images. On May 24, when the floodwaters at St. Louis receded to bankfull stage, imagery was again obtained by ERTS. Analysis of temporal data composites of the pre-flood and post-flood band 7 images indicates that changes in surface reflectance characteristics caused by the flooding can be delineated, thus making it possible to map the overall area flooded without the necessity of a real-time system to track and image the peak flood waves. Regional planning and disaster relief agencies such as the Corps of Engineers, Office of Emergency Preparedness, Soil Conservation Service, interstate river basin commissions and state agencies, as well as private lending and insurance institutions, have indicated strong potential applications for ERTS image-maps of flood-prone areas. (Knapp-USGS)

W75-01361

FLOOD INUNDATION IN THE SOUTHEASTERN UNITED STATES FROM AIRCRAFT AND SATELLITE IMAGERY,
Geological Survey, Bay Saint Louis, Miss.
G. K. Moore, and G. W. North.
Water Resources Bulletin, Vol 10, No 5, p 1082-1096, October 1974. 11 fig, 2 tab, 5 ref.

Descriptors: *Remote sensing, *Floods, *Satellites(Artificial), *Mapping, Infrared radiation, Flood plains, Alabama, Mississippi, Louisiana, Arkansas, Tennessee, Southeast US.
Identifiers: *ERTS.

Panchromatic black and white, color, and color infrared photographs and thermal infrared imagery are compared for a capability to show flood boundaries. In open agricultural and urban areas, these boundaries are easily delineated on all types of film. Boundaries are more difficult to see in wooded areas. In March, hardwood trees are dormant, but black and white photographs and color photographs show only the tops of these trees. Color infrared photographs in January and March have a distinctive color or tone in inundated woods; the limit of this tone is the flood boundary. Daytime thermal infrared imagery in March shows that inundated woods are cooler than dry land but warmer than open water. After about April 1, both color infrared photography and thermal infrared imagery show only the top of the tree canopy and do not reflect underlying floodwater. Inundated areas can be delineated easily on ERTS satellite imagery from December through March. On imagery from May 4-5, 1973, the tree canopy obscured floodwaters in wooded areas. Despite this problem, the results of mapping flood boundaries on May imagery are reasonable for the scale of the imagery. (Knapp-USGS)
W75-01363

LOWCON - AN INSTRUMENT FOR CONTINUOUS MEASUREMENT OF LOW FIBER CONCENTRATIONS. PART I. PRINCIPLE OF MEASUREMENT (LOWCONEIN GERAET ZUR KONTINUIERLICHEN MESSUNG NIEDRIGER FASERKONZENTRATION. TEIL I: PRINZIP DER MESSUNG),
For primary bibliographic entry see Field 5A.
W75-01373

LOWCON - AN INSTRUMENT FOR CONTINUOUS MEASUREMENT OF LOW FIBER CONCENTRATIONS. PART II. MEASUREMENT OF THE FIBER CONTENT IN PULP AND PAPER MILL EFFLUENTS (LOWCON - EIN GERAET ZUR KONTINUIERLICHEN MESSUNG NIEDRIGER FASERKONZENTRATION. TEIL II: MESSUNG DES FASERGEHALTES IM ABWASSER VON ZELLSTOFF- UND PAPIERFABRIKEN),
For primary bibliographic entry see Field 5A.
W75-01374

SAMPLING EFFICIENCY OF FOUR TYPES OF MUD BOTTOM SAMPLERS,
Institue of Freshwater Research, Drottningholm (Sweden).
G. Milbrink, and T. Wiederholm.
Oikos, Vol 24, No 3, p 479-482, 1973, Illus.
Identifiers: *Chironomid larvae, *Mud bottom samplers, *Samplers, *Sampling efficiency, Statistical methods, Water sampling.

Results of tests comparing the sampling efficiency of 2 box samplers (Ekman type) and 2 tube samplers commonly used on mud bottoms in freshwater, i.e., a standard Ekman sampler, a modified Ekman sampler, a compound sampler and a commercial version of a single corer, are presented. Tests are focused on the efficiency of sampling chironomid larvae, these larvae being a major component of the bottom fauna in the area selected for the study. No sampler was found to diverge from the others to any great extent. However, statistical tests proved the standard Ekman and the multiple corer to be slightly more effective than the other 2.--Copyright 1974, Biological Abstracts, Inc.
W75-01401

SOME TECHNIQUES ADAPTABLE FOR APPLICATION IN HYDROGEOLOGICAL INVESTIGATIONS IN CEYLON,
K. Kularatnam.
In: Water for the Human Environment, Volume 1, Congress Papers; Proceedings of the First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 242-246.

Descriptors: *Water resources, Hydrologic data, *Instrumentation, *Investigations, Hydrology, Watersheds(Basins), Precipitation(Atmospheric), Evaporation, Evapotranspiration, Groundwater, Soil moisture, Runoff, Water balance, Sediment load, Precipitation gages, Current meters, Lysimeters, Soil moisture meters.
Identifiers: *Developing countries, *Ceylon.

The inexpensive equipment and techniques that may be considered within reach of developing countries for use in hydrological investigations were listed. Hydrological investigations discussed were precipitation, evaporation, soil moisture, groundwater, runoff, and river sediment. It was expected that some of the methods indicated would be improvised locally with the necessary adaptations for obtaining results adequate for practical purposes. (See also W75-01428) (Humphreys-ISWS)
W75-01451

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-01462

APPLICATION OF GROUNDWATER MEASUREMENTS BY MEANS OF RADIOISOTOPES ON GROUNDWATER EXPLORATION,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Radiohydrometrie.
For primary bibliographic entry see Field 4B.
W75-01463

A WHEELED DEVICE FOR SAMPLING THE BIOTA OF A CONCRETE-LINED CANAL,
Bureau of Relamation, Tracy, Calif.
G. Bryant.
Calif Fish Game. Vol 60, No 2, p 97-99, 1974.
Identifiers: *Biota, *California(Delta-Mendota Canal), *Canals, *Concrete-lined canals, *Sampling devices.

A wheeled device for sampling canal linings is illustrated and described. The device was developed during sampling work on the Delta-Mendota Canal (California).--Copyright 1974, Biological Abstracts, Inc.
W75-01487

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W75-01515

ADVANCED CONCEPTS AND TECHNIQUES IN THE STUDY OF SNOW AND ICE RESOURCES.
For primary bibliographic entry see Field 2C.
W75-01522

NEW CONCEPTS IN SNOW SURVEYING TO MEET EXPANDING NEEDS,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
M. Barton.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 39-46, 1974. 1 tab, 4 ref.

Descriptors: *Snow surveys, *Data collections, *Telemetry, Remote sensing, Automation, Snowpacks, Snowfall, Water equivalent, Moisture meters, Instrumentation, Water yield, Hydrologic data, Runoff forecasting, International Hydrological Decade.

Snow surveys are normally made in the Western States at monthly intervals from February 1 to end of snowmelt. Until recently these data have been obtained gravimetrically by men traveling to the site on foot or in oversnow vehicles. Until recently the snow surveys have had a single purpose only--to provide a forecast of the streamflow to come from the measured snowpack. Increased population and per capita water consumption demand better utilization of available water. This requires more accurate forecasts of amounts and timing of streamflow originating from snowpacks. It also demands 'real time' data for use in forecasting. A suggested system is flexible so that new types of data acquisition systems can be added as they become available. The system should also provide the new data needed by all interests, including recreation, structural design, and flood and avalanche warning. The variety, quality and quantity of data which can be obtained at automated sites far exceeds that at the typical manual site. A typical automatic site can be instrumented to measure snow water equivalent, precipitation, wind direction and speed, temperature, relative humidity, solar radiation, soil moisture, and many other hydrometeorological variables. In addition, devices such as the isotopic snow gage can be installed to provide expanded data concerning the internal characteristics of the in situ snowpack. (See also W75-01522) (Knapp-USGS)
W75-01526

LONG-RANGE GOAL AND INFORMATION NEEDS OF THE COORDINATED SNOW SURVEY PROGRAM IN CALIFORNIA,
California Cooperative Snow Surveys, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 7C.
W75-01527

ON PREDICTING WATER RUNOFF FROM A SNOW COVER,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W75-01528

MEASUREMENT OF ALBEDO OVER POLAR SNOW AND ICE FIELDS USING NIMBUS-3 SATELLITE DATA,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
T. H. Vonder Haar.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 161-168, 1974. 4 fig, 6 ref. Grant NGR 06-002-102.

Descriptors: *Energy budget, *Albedo, *Arctic, *Snowpacks, *Remote sensing, Weather, Climatology, Satellites(Artificial), Weather patterns, International Hydrological Decade.

Measurements from meteorological satellites yielded total spectral albedo over both polar regions at moderately high resolution. The data-reduction technique, the usefulness of surface measurements to augment the satellite observations, and the patterns and extremes of polar albedo variation measured during 1969-1970 are described. Albedo values over the Antarctic and Greenland icefields often exceed 60%. The minimum values of circumpolar isolines mark the farthest recession of the snowfields and pack ice. (See also W75-01522) (Knapp-USGS)
W75-01537

ICE THICKNESS AND VARIABILITY ON SILVER LAKE, GENESEE COUNTY, MICHIGAN: A RADAR APPROACH,
Environmental Research Inst. of Michigan, Flint.
For primary bibliographic entry see Field 2C.
W75-01542

SURFACE MEASUREMENTS OF SNOW AND ICE FOR CORRELATION WITH DATA COLLECTED BY REMOTE SYSTEMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
M. A. Bilello.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 283-293, 1974. 7 fig, 1 tab, 17 ref.

Descriptors: *Data collections, *Snow surveys, *Snow cover, *Arctic, Canada, United States, Ice, Lake ice, Sea ice, Snowpacks, International Hydrological Decade, Reviews, Hydrologic data, Remote sensing, Telemetry.

Determining the depth and physical properties of the snow cover and the thickness of ice by remote methods is in an early stage of development. Data collected from such remote systems could be correlated with actual surface conditions by using an existing network of over 100 snow and ice observing stations located in North America above 45 deg N latitude. This network provides weekly snow and ice measurements during the winter. The stations in the network, the types of measurements made and equipment used, and the results of studies derived from the collected data are described. The 10 to 20 years of record, as well as the data currently being received, provide an extensive and reliable source of information for comparing or verifying observations obtained by other methods. (See also W75-01522) (Knapp-USGS)
W75-01548

A NEW CALIFORNIA DEPARTMENT OF WATER RESOURCES TELEMETRY SYSTEM,
California State Dept. of Water Resources, Sacramento.
G. W. Barnes, Jr.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 329-338, 1974. 7 fig.

Descriptors: *Telemetry, *Runoff forecasting, *Streamflow forecasting, *California, *Hydrologic data, Data collections, Data transmission, Snowmelt, Snowpacks, Runoff forecasting, International Hydrological Decade.

The California Department of Water Resources recently installed a new telemetry system to collect hydrologic and meteorologic data automatically. The system is computer controlled and uses the State's microwave system and mountain top VHF radio repeaters for communications. The remote data stations are modular in construction and may accept both analog and digital sensors. The purpose of the system is to obtain operational hydrologic and meteorologic data for flood forecasting and snowmelt forecasting, and for use in operation of the State Water Project. The telemetry system provides precipitation, streamflow, temperature, snow water equivalent, and water conductivity data from the Sierras and the Central Valley of California. (See also W75-01522) (Knapp-USGS)
W75-01552

A REAL-TIME DATA NETWORK FOR AVALANCHE FORECASTING IN THE CASCADE MOUNTAINS OF WASHINGTON STATE,
Washington Univ., Seattle. Geophysics Program.
E. R. LaChapelle, and T. Fox.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 339-345, 1974. 1 fig, 1 tab, 4 ref. NSF Grant GU-2655.

Descriptors: *Avalanches, *Data collections, *Meteorological data, *Washington, *Snowpacks, Telemetry, Data processing, Forecasting, Snow surveys, Snowfall, International Hydrological Decade.
Identifiers: *Avalanche forecasting.

A network was established for collecting a daily flow of data on snow, weather and avalanche conditions in the Cascade Mountains together with a full spectrum of synoptic weather information. This network furnishes the basis for operational avalanche forecasting for mountain highways and a feedback of regional avalanche data with mountain weather forecasts to forecasters. Two years of data from this network served to identify snowfall distribution patterns over the Cascades, the relation of these patterns to weather systems, and the patterns of weather which lead to major avalanche cycles. Intense frontal systems with open warm sectors which produce rain following large quantities of snowfall produce the clearset such pattern. Cold snowfalls produce conditional instability amenable to artificial avalanche release, but few natural releases. The progression of avalanche occurrence through the Cascade Mountains can be correlated with the progression of frontal systems. (See also W75-01522) (Knapp-USGS)
W75-01553

MODERN DEMANDS ON THE CANADIAN ICE ADVISORY SERVICE,
Atmospheric Environment Service, Downsview (Ontario). Ice Forecasting Central.
W. E. Markham.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 370-375, 1974.

Descriptors: *Sea ice, *Lake ice, *Canada, *Surveys, Forecasting, Data collections, Navigation, Telemetry, Data transmission, International Hydrological Decade.

Canada has a comprehensive sea ice reconnaissance and forecasting program which extends from the Great Lakes and Grand Banks in winter to the fringes of the Arctic Ocean in summer. Visual mapping and message relay from short range aircraft has given way almost exclusively to teams of observers aided by an array of remote sensors passing data directly to icebreakers and from airport to forecast office using facsimile equipment. Considerable improvements in observing capability and in data handling are required and steps are being taken to explore and exploit these as national economics permit. (See also W75-01522) (Knapp-USGS)
W75-01557

USE OF RADAR TECHNIQUES FOR SEA ICE MAPPING,
Kansas Univ., Center for Research, Inc., Lawrence. Remote Sensing Lab.
S. K. Parashar, R. K. Moore, and A. W. Biggs.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 381-390, 1974. 8 fig, 6 ref. NASA Contract NAS9-10261. Navy Contract N60921-70-C-0021.

Descriptors: *Sea ice, *Radar, *Remote sensing, *Mapping, Data collections, Ice cover, Arctic, Navigation, Satellites(Artificial), International Hydrological Decade.

Radar scattering data were collected from sea ice at 400MHz and 13.3 GHz near Point Barrow, Alaska. Seven categories of sea ice were identified on aerial photographs. The radar backscatter cross-section was compared for different categories of sea ice at various incident angles. Multiyear ice (ice more than 180 cm thick) gives the strongest return at 400 MHz. Water can be differentiated at both the frequencies. Some ambiguity exists between radar returns from the thinnest ice layer (under 18 cm thick) and a moderately thick layer (90 to 180 cm thick) at 13.3 GHz. Although 400 MHz is not as satisfactory for ice identification as 13.3 GHz, combining a 400 MHz and 13.3 GHz system eliminates the ambiguity regarding the very thin ice. (See also W75-01522) (Knapp-USGS)
W75-01558

MEASUREMENT OF SNOWFALL BY RADAR,
Center for the Environment and Man, Inc., Hartford, Conn.
J. W. Wilson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 391-401, 1974. 5 fig, 1 tab, 11 ref. NFS Grant GJ-9.

Descriptors: *Radar, *Snowfall, *Remote sensing, Precipitation gages, Calibrations, Cloud physics, Precipitation(Atmospheric), Lake Ontario, International Hydrological Decade.

An S-band and C-band radar were used to estimate the water equivalent of snow above approximately 75 gages near Lake Ontario for the winter of 1972-73. Thirteen of the gages were specially sited to provide the maximum amount of natural protection from the adverse effects of wind. Radar can be used to measure snowfall with approximately the same accuracy as for rainfall provided an empirically derived range correction is applied to the radar estimates. The maximum radar range of useful snowfall estimates is less than for rainfall because, for snow, precipitation rates are lower and precipitation growth occurs at lower altitudes. The accuracy of the radar varies with storm type. The highest accuracies were associated with large-scale storms which are characterized by relatively high altitude snowfall growth; the lowest accuracies were associated with orographic lifting and with lake-generated showers. Radar reflectivity was affected by the type of snow crystal. The root mean square error in the radar estimates can be reduced up to 50% through the use of a reference gage to adjust the radar snowfall estimates. (See also W75-02522) (Knapp-USGS)
W75-01559

APPLICATION OF SLAR FOR MONITORING GREAT LAKES TOTAL ICE COVER,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. J. Jirberg, R. J. Schertler, R. T. Gedney, and H. Mark.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 402-411, 1974. 6 fig, 3 ref.

Descriptors: *Great Lakes, *Lake ice, *Iced lakes, *Remote sensing, *Radar, Mapping, Ice cover, Navigation, International Hydrological Decade, Monitoring.

Side-looking airborne radar (SLAR) shows the development and disintegration of the entire ice cover on Lake Erie during the winter of 1972-1973. Simultaneous ground truth observations and ERTS-1 photography were used to establish accurate correlations of radar responses with ice conditions. The all-weather, broad areal mapping capability of SLAR is a means for obtaining the repeated coverage needed for winter navigation on the Great Lakes. (See also W75-01522) (Knapp-USGS)
W75-01560

LAKE ONTARIO SNOWFALL OBSERVATIONAL NETWORK FOR CALIBRATING RADAR MEASUREMENTS,
National Weather Service, Silver Springs, Md.
E. L. Peck, L. W. Larson, and J. W. Wilson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 412-421, 1974. 3 fig, 2 tab, 8 ref.

Descriptors: *Snowfall, *Precipitation gages, *Radar, *Calibrations, Networks, *New York, *Lake Ontario, Precipitation(Atmospheric), International Hydrological Decade.

A network of 13 precipitation gages was installed near Lake Ontario to provide improved measurements for evaluating the use of radar for measuring snowfall. The locations of the gages were chosen to provide a uniform distribution for one sector of the radar coverage. Each gage site was selected to provide the maximum amount of natural protection to minimize the adverse effects that wind movement has on gage measurement of snowfall. The importance of having reliable snowfall measurements for evaluating other measurement techniques is demonstrated by comparison of point and areal values among those from the special network, the radar estimates and regular climatic stations in the same area. The snowfall observational network is located north of Syracuse, New York and east of Lake Ontario, and covers an area of roughly 350 square miles. The elevation generally increases from west to east and south to north across the network and varies from about 250 feet MSL to 1300 feet MSL. The area is a combination of farmland and gently rolling woodlands. An attempt was made to place all of the 13 network gages in well-protected locations. In general, each gage was sheltered in all directions by coniferous forest subtending angles of 30 to 45 deg from the gage orifice with the forest of sufficient depth to minimize eddy effects. (See also W75-01522) (Knapp-USGS)
W75-01561

AIRBORNE PROFILING OF ICE THICKNESS USING A SHORT PULSE RADAR,
Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
R. S. Vickers, J. E. Heighway, and R. T. Gedney.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 422-431, 1974. 9 fig, 6 ref.

Descriptors: *Ice cover, *Radar, *Remote sensing, Profiles, Instrumentation, Lake ice, Sea ice, Lake Superior, Great Lakes, International Hydrological Decade.

Ice thickness may be measured with a high resolution, non-imaging, short pulse radar, operating at a carrier frequency of 2.7 GHz. The system can resolve reflective surfaces separated by as little as 10 cm and permits measurement of the distance between resolvable surfaces with an accuracy of about 1 cm. Data samples are given for measurements both in a static (helicopter hovering), and a traverse mode. Ground truth measurements taken by an ice auger team traveling with the helicopter are compared with the remotely sensed data and the accuracy of the profiler is discussed based on these measurements. (See also W75-01522) (Knapp-USGS)
W75-01562

CONTINUOUS SEA AND FRESH WATER ICE THICKNESS PROFILING USING AN IMPULSE RADAR SYSTEM,
Geophysical Survey Systems, Inc., North Billerica, Mass.
K. J. Campbell, and A. S. Orange.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 432-442, 1974. 5 fig, 5 ref.

Descriptors: *Radar, *Ice cover, *Profiles, *Sea ice, *Lake ice, *Glaciers, Sounding, Instrumentation, International Hydrological Decade.

An impulse radar system provides a continuous profile of seawater and freshwater ice thickness. This system can be considered the electromagnetic equivalent of single-trace acoustic profiling systems used in marine sub-bottom profiling. An electromagnetic pulse is generated on the ice surface and the reflections from the surface and the ice water interface are displayed on a continuous strip-chart recorder. Travel times of the reflected pulses can be converted directly to ice thickness. Structural features within the ice including both wet and dry cracks as little as 4 to 5 mm wide can be detected. Operational surveys have been performed for oil companies and geophysical contractors at several locations in the Canadian Arctic to insure the safety of on-the-ice operations and to contribute to the more economical utilization of personnel and equipment. The system can be applied to thickness measurement of glacial ice and to crevasse detection. (See also W75-01522) (Knapp-USGS)
W75-01563

THE ROLE OF SATELLITES IN SNOW AND ICE MEASUREMENTS,
National Environmental Satellite Service, Washington, D.C.
D. R. Wiesnet.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 447-456, 1974. 4 fig, 2 tab.

Descriptors: *Satellites(Artificial), *Remote sensing, *Snow cover, *Ice cover, Data collections, Surveys, Mapping, Snowmelt, Microwaves, International Hydrological Decade, Infrared radiation.

Earth-orbiting polar satellites are desirable platforms for remote sensing of snow and ice. Geostationary satellites at very high altitude (35,000 km) are also desirable platforms for many remote sensors, particularly for communications relay, flood warning systems, and telemetry of unattended instrumentation in remote, inaccessible places such as the Arctic, Antarctic, or mountain tops. The National Environmental Satellite Service maintains both types of environmental satellites as part of its mission. The NOAA-2 satellite currently in use provides twice-a-day earth coverage in a near-polar orbit at an altidue of 1500 km. The NOAA-2 Very High Resolution Radiometer (VHRR) is a new, significantly improved dual channel scanner (visible and infrared) that has been used experimentally for detailed snow mapping. NASA's Nimbus-5 satellite carries an Electrically Scanning Microwave Radiometer (ESMR) capable of measuring the earth's brightness temperature--hence its snow cover--through almost any cloud cover. (See also W75-01522) (Knapp-USGS)
W75-01564

SOME NEW SATELLITE MEASUREMENTS AND THEIR APPLICATION TO SEA ICE ANALYSIS IN THE ARCTIC AND ANTARCTIC,
National Environmental Satellite Service, Washington, D.C.
E. P. McClain.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 457-466, 1974. 4 fig, 19 ref.

Descriptors: *Remote sensing, *Microwaves, *Ice cover, *Sea ice, *Satellites(Artificial), Radar, Mapping, Data collections, Arctic, International Hydrological Decade.

The NOAA-2 operational environmental satellite carries a new Very High Resolution Radiometer (VHRR) capable of 1 kilometer ground resolution in the visible and thermal infrared portions of the spectrum. The areal coverage and frequency of coverage is much greater than that afforded by NASA's Earth Resources Technology Satellite (ERTS-1). The VHRR data have greatly improved the ease and reliability of satellite image interpretation for the detection and monitoring of ice pack features and condition, even during the months of polar night darkness. Visual and infrared observations of sea ice from satellites are often severely limited by cloud cover. The microwave imager on the Nimbus 5 satellite does not suffer this constraint. (See also W75-01522) (Knapp-USGS)
W75-01565

SNOW STUDIES USING VISIBLE AND INFRARED MEASUREMENTS FROM EARTH SATELLITES,
Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, C. J. Bowley, and D. A. Simmes.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 477-486, 1974. 1 fig, 12 ref.

Descriptors: *Snow surveys, *Infrared radiation, *Remote sensing, *Satellites(Artificial), *Mapping, Snow cover, Snowpacks, Aerial photography, Data collections, International Hydrological Decade.
Identifiers: ERTS.

Thermal IR measurements made from satellites can be a useful tool for mapping gross snow-cover patterns, at least in relatively flat terrain. Snow-cover areas are usually depicted by significantly brighter tones (lower temperatures) than the surrounding snow-free terrain. Analysis of ERTS imagery for two test sites, the Salt-Verde

Watershed in central Arizona and the southern Sierra Nevada in California, indicates that snow extent can be mapped from ERTS in more detail than is depicted on aerial survey snow charts. Although small details in the snowline can be mapped better from higher resolution aircraft photographs, boundaries of the areas of significant snow cover can be mapped as accurately from the ERTS imagery as from the aircraft photography. (See also W75-01522) (Knapp-USGS)
W75-01567

DETECTION OF BURIED GLACIAL AND GROUND ICE WITH THERMAL INFRARED REMOTE SENSING,
State Univ. of New York Coll. at Geneseo.
R. Lougeay.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 487-493, 1974. 4 fig, 3 ref.

Descriptors: *Remote sensing, *Frozen ground, *Ice, *Glaciers, *Permafrost, Infrared radiation, Aerial photography, Albedo, Surveys, Monitoring, Mapping, Frozen soils, Ice cover, Snow cover, International Hydrological Decade.
Identifiers: Ground ice.

Thermal remote sensing techniques may be used for detection and mapping of moraine-covered glacial ice and shallowly buried ground ice. Surface temperature, and thus the emitted terrestrial radiation, is closely correlated to the thickness of detrital mantle which covers an ice core. Various types of ice-cored features show strong thermal contrast in the thermal infrared regions of the spectrum, but show similar surface configuration and albedo values. Thermal remote sensing of buried ground ice is dependent upon the magnitude of thermal contrasts between various surfaces. Field observations of thermal contrast over various ice-cored surfaces yield temporal and spatial patterns of thermal contrast which indicate optimum conditions for detection of buried ground ice by thermal remote sensing techniques. The field methods discussed are useful for preliminary reconnaissance to locate large masses of ice which would be hidden from the air photo interpreter. Also, these field methods have proved essential in determining optimum conditions for thermal remote sensing surveys related to an inventory of buried ice. (See also W75-01522) (Knapp-USGS)
W75-01568

HYDROLOGIC CHARACTERISTICS OF SNOW-COVERED TERRAIN FROM THERMAL INFRARED IMAGERY,
Defense Mapping Agency Topographic Center, Washington, D.C.
A. O. Poulin.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 494-503, 1974. 6 fig, 8 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Snow cover, *Ice cover, Sea ice, Lake ice, Snowpacks, Satellites(Artificial), Aerial photography, Arctic, Water temperature, Surveys, Mapping, International Hydrological Decade.

Snow cover may be penetrated by thermal infrared imagery to reveal concealed hydrologic features or changes in their conditions. Subsurface thermal regimes of features such as streams, frozen lakes, and areas of deeper snow often produce surface temperature differences that are sufficient for the production of thermal images. Measurements at a frozen arctic shoreline indicate that the part of these temperature differences resulting from systematic variations of the energy balance components is sufficiently large that it can be distinguished from the part due to random variations. A phenomenon which was given the name 'cold fringe effect' should allow the identification of areas in which the ice on bodies of water is frozen to the bottom. A qualitative model was developed for the diurnal variation of a shoreline temperature differential throughout the winter season, and studies are in progress to evaluate it using measurements from both aircraft and spacecraft. (See also W75-01522) (Knapp-USGS)
W75-01569

REMOTE SENSING APPLICATIONS IN CANADIAN ICE RECONNAISSANCE,
Department of the Environment, Downsview (Ontario).
H. G. Hengeveld.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 504-512, 1974. 4 fig.

Descriptors: *Remote sensing, *Ice cover, *Canada, Lake ice, Sea ice, Data collections, Monitoring, Surveying, Mapping, International Hydrological Decade, Infrared radiation, Radar, Profiles, Aerial photography.
Identifiers: Lasers.

Remote sensing techniques are being investigated and integrated into the Canadian ice reconnaissance program in order to improve the program to an all weather, day and night capability. Two Electra aircraft used for a routing visual and radar ice observing program are equipped with an infrared line scan system, a laser profilometer system and a trimetrigon Vinten camera system. Applications and interpretation problems of Side Looking Airborne Radar imagery are also being investigated. Real time data availability for immediate inflight interpretation and analysis is emphasized. The formats of the real time as well as permanent data records, the interpretation methods, and the analysis of the available information are discussed. (See also W75-01522) (Knapp-USGS)
W75-01570

BREAK-UP CHARACTERISTICS OF THE CHENA RIVER WATERSHED, CENTRAL ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W75-01572

TECHNIQUES FOR DETERMINING AREAL EXTENT OF SNOW IN THE SIERRA NEVADA MOUNTAINS USING HIGH ALTITUDE AIRCRAFT AND SPACECRAFT IMAGERY,
California Univ., Berkeley. Center for Remote Sensing Research.
D. T. Lauer, and W. C. Draeger.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 532-540, 1974. 3 fig, 17 ref. NASA Grant NGL 05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Satellites(Artificial), *Aerial photography, Terrain analysis, Snowpacks, Snow surveys, Streamflow forecasting, Snowmelt, Runoff forecasting, International Hydrological Decade.
Identifiers: *ERTS.

Snow cover was studied using sequential aerial photography, Earth Resources Technology Satellite (ERTS-1) imagery, and ground data. An image interpretation key was developed to be used as an aid in interpreting areal extent of snow in forested areas. An efficient photo-interpretation technique was developed for estimating acreages of snow cover. The level of accuracy of the interpretation technique was tested as applied to a 1.5 million acre area within the Feather River watershed in northern California. The interpretation key and the interpretation technique, when applied in a test situation, resulted in an estimate of snow cover with an accuracy of 96.3 percent. (See also W75-01522) (Knapp-USGS)
W75-01573

POLAR SEA ICE OBSERVATIONS BY MEANS OF MICROWAVE RADIOMETRY,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. Gloersen, T. C. Chang, T. T. Wilheit, and W. J. Campbell.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 541-550, 1974. 6 fig, 5 ref.

Descriptors: *Sea ice, *Remote sensing, *Microwaves, *Satellites(Artificial), Surveys, Data collections, Ice cover, Melting, Freezing, International Hydrological Decade.
Identifiers: *Microwave radiometry.

Microwaves of 1.55 cm wavelength emanating from the surface of the Earth may be used for studying the changing characteristics of polar sea ice. Recent data obtained at that wavelength with an imaging radiometer on board the Nimbus 5 satellite are used to illustrate how the seasonal changes in extent of sea ice in both polar regions may be monitored free of atmospheric interference. Within a season, changes in the compactness of the sea ice are also observed from the satellite. Some substantial areas of the Arctic sea ice canopy identified as first-year ice in the past winter were observed not to melt this summer, a graphic illustration of the eventual formation of multiyear ice in the Arctic. The microwave emissivity of some of the multiyear ice areas near the North Pole increased significantly in the summer, probably due to liquid water content in the firn layer. (See also W75-01522) (Knapp-USGS)
W75-01574

MICROWAVE SIGNATURES OF SNOW AND FRESH WATER ICE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. Schmugge, T. T. Wilheit, P. Gloersen, M. F. Meier, and D. Frank.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 551-562, 1974. 4 fig, 3 tab, 12 ref.

Descriptors: *Snow, *Lake ice, *Remote sensing, *Microwaves, Snow cover, Ice cover, Snowmelt, Radar, Firn, Water equivalent, International Hydrological Decade, Utah, Colorado, Washington.
Identifiers: *Microwave radiometry.

In order to obtain data on the microwave signature of snow, flights were made over 3 snow-covered sites by the NASA CV-990 Airborne Observatory in March 1971. The dry snow had different substrata: lake ice at Bear Lake in Utah; wet soil in the Yampa River Valley near Steamboat Springs, Colorado; and glacier ice, firn and wet snow on the South Cascade Glacier in Washington. The transparency of the snow cover is a function of wavelength. False-color images of microwave brightness temperatures obtained from a scanning radiometer operating at a wavelength of 1.55 cm demonstrate the capability of scanning radiometers for mapping snowfields. The effects of volume scattering in dry snow and firn become noticeable for free space wavelengths shorter than

about 3 cm. When liquid water is present, the effective loss tangent for the snow increases to wash out the effects of volume scattering. This is the same mechanism that produces the higher brightness temperature at these wavelengths in first year sea ice when the scattering centers (brine cells) are filed with liquid. The rise in brightness temperature for wet snow indicates that it may be possible to detect the onset of snow melting by looking at brightness temperature differences between day and night passes over snowfields. (See also W75-01522) (Knapp-USGS)
W75-01575

MESOSCALE DEFORMATION OF SEA ICE FROM SATELLITE IMAGERY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. K. Crowder, H. L. McKim, S. F. Ackley, W. D. Hibler, III, and D. M. Anderson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 563-573, 1974. 7 fig, 10 ref.

Descriptors: *Sea ice, *Deformation, *Remote sensing, *Satellites(Artificial), Strain, Ice cover, Aerial photography, Monitoring, Surveys, International Hydrological Decade.
Identifiers: ERTS.

Sequential mesoscale movement and deformation in the pack ice approximately 90 km northeast of Point Barrow, Alaska, were observed in ERTS-1 multispectral imagery of March 19-22, 1973. At this latitude, sidelap of adjacent ground tracks of daily overpasses is about 75%. This sidelap, together with the coincidence of five cloud-free days and a major westward movement of the pack in the Beaufort Sea Gyre, permitted observation of drift and deformation in an area of about 14,000 sq km. Strain calculations using several 10-point arrays yielded shear and divergence rates as large as 0.5% per hour. Continuous deformation measurements through the fast-ice/pack-ice boundary indicated a sharp change in the sign of the vorticity as the shear zone was crossed. Measured drift velocities varied from 0.24 m/sec to 0.4 m/sec. Detailed deformation and movement data can be obtained from sequential ERTS-1 images. Such data are useful for determining scaling effects in the ice velocity field and for testing existing mathematical models of the response of sea ice to meteorological and hydrodynamic stresses. (See also W75-01522) (Knapp-USGS)
W75-01576

AN EXPERIMENTAL GAMMA-RAY SPECTROMETER SNOW SURVEY OVER SOUTHERN ONTARIO,
Geological Survey of Canada, Ottawa (Ontario).
R. L. Grasty, H. S. Loijens, and H. L. Ferguson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 579-593, 1974. 2 fig, 7 tab, 14 ref.

Descriptors: *Snow surveys, *Remote sensing, *Water equivalent, Gamma rays, *Nuclear moisture meters, Snowpacks, Snow cover, *Canada, Potassium radioisotopes, International Hydrological Decade, Data collections, Mapping.
Identifiers: *Gamma-ray spectrometry.

Gamma-ray spectrometer surveys were flown over Southern Ontario to determine snow-water equivalent. The airborne results are compared with ground data from 10 snow courses established along the flight lines. A root mean square deviation of 1.2 cm water equivalent was found between the ground-level and airborne results, whereas a deviation of 1.7 cm water equivalent was calculated between data from sampling and those from the total radioactivity information. Soil moisture corrections from measurements at selected sites decreased the error. Errors in the soil moisture measurements and background variations encountered along the flight lines were more important than statistical errors. (See also W75-01522) (Knapp-USGS)
W75-01577

AREAL SNOWPACK WATER-EQUIVALENT DETERMINATIONS USING AIRBORNE MEASUREMENTS OF PASSIVE TERRESTRIAL GAMMA RADIATION,
EG and G, Inc., Las Vegas, Nev.
E. B. Jones, A. E. Fritzsche, Z. G. Burson, and D. L. Burge.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 594-603, 1974. 2 fig, 3 tab, 11 ref.

Descriptors: *Snow surveys, *Remote sensing, *Water equivalent, *Gamma rays, *Nuclear moisture meters, Snowpacks, Snow cover, Potassium radioisotopes, International Hydrological Decade, Data collections, Mapping.

Airborne measurement of the areal average of the water equivalent of snow by the terrestrial gamma attenuation method is accurate to 1.2 cm or 10% (whichever is greater). Airborne survey data from study areas in the midwest show that airborne radon daughters, soil moisture, and gamma counting statistics are the predominant sources of error. The method has good potential for large, rapid areal measurements of water equivalent over flat or rolling terrain. (See also W75-01522) (Knapp-USGS)
W75-01578

MEASUREMENT OF SNOW AT A REMOTE SITE: NATURAL RADIOACTIVITY TECHNIQUE,
National Weather Service, Silver Spring, Md.
V. C. Bissell, and E. L. Peck.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 604-613, 1974. 5 fig, 2 tab, 8 ref.

Descriptors: *Snow surveys, *Water equivalent, *Remote sensing, *Radioactivity techniques, *Nuclear moisture meters, Gamma rays, Snowpacks, International Hydrological Decade, Snow cover, Soil moisture, Data collections.
Identifiers: Cosmic radiation.

Natural gamma radiation from the soil was tested for use in snow water equivalent measurements at remote sites. Measurements with about 5% error in the 5 to 40 centimeter water equivalent range can be obtained in periods uncomplicated by precipitation or considerable change in soil moisture. Periods of active melt can be subject to serious errors. A new natural radioactivity method is also proposed. The use of highly penetrating cosmic radiation appears to have excellent potential for point snow water equivalent measurement in extremely deep snow. (See also W75-01522) (Knapp-USGS)
W75-01579

NATURAL GAMMA SPECTRAL PEAK METHOD FOR SNOW MEASUREMENT FROM AIRCRAFT,
National Weather Service, Silver Spring, Md.
V. C. Bissell.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 614-623, 1974. 2 fig, 5 tab, 14 ref.

Descriptors: *Snow surveys, *Gamma rays, *Potassium radioisotopes, *Nuclear moisture meters, *Remote sensing, Snow cover, Water equivalent, Snowpacks, Soil moisture, International Hydrological Decade, Data collections.
Identifiers: *Gamma-ray spectrometry.

The accuracy of airborne measurements of snow water equivalent over large areas using the spectral peak of gamma radiation of K-40 is limited both by the accuracy of soil moisture estimates and by variation in general radon distributions between missions. The accuracy of the method when using the spectral peak of T1-208 is constrained only by soil moisture estimate accuracy and is therefore preferred over large areas. The use of an optimal linear combination of the K-40 and T1-208 methods significantly improves accuracy over small basins where only one or two flights are made. To complement current literature on gamma snow surveys, dynamic aspects of radon in both soil and atmosphere are reviewed. (See also W75-01522) (Knapp-USGS)
W75-01580

UTILITY OF ISOTOPE PROFILING SNOW GAGE FOR WATER MANAGEMENT,
Booneville Power Administration, Portland, Oreg.
F. A. Limpert, and J. L. Smith.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 624-631, 1974. 1 fig, 7 ref.

Descriptors: *Snow surveys, *Nuclear moisture meters, *Water equivalent, *Snowmelt, *Runoff forecasting, Reservoir operation, Pacific Northwest US, International Hydrological Decade, Radioisotopes, Snowpacks.
Identifiers: *Snow gages.

The isotope profiling snow gage is a valuable adjunct to the hydrometeorological network in the northwestern U.S. The snowpacks contributing to flow of the Columbia River can be considered as uncontrolled headwater reservoirs. There are two problems inherent in their operation in relation to more efficient operation of the downstream reservoirs which they feed. These are: (1) determination of amount of water in storage, and (2) time of release of water from these uncontrolled reservoirs. Both amount of water in a snowpack and its interior density profile can be determined with the profiling isotope snow gage. Data from the gage provide: (1) total snow depth; (2) snow density at 0.5-inch vertical intervals and average pack density; (3) total water content; (4) changes in water content in the pack and where they occur; (5) amount of new snow since the last measurement; (6) amount and intensity of rainfall on the snow until the pack begins to discharge water; (7) melt rate between measurements when melt is occurring; and (8) changes in soil moisture content. (See also W75-01522) (Knapp-USGS)
W75-01581

NUCLEAR TECHNIQUES FOR SNOW AND ICE STUDIES IN CANADIAN SUBPOLAR REGIONS (DEVON ISLAND),
Canada Center for Inland Waters, Burlington (Ontario).
F. A. Prantl, R. M. Koerner, and E. Robertson.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 632-641, 1974. 4 fig, 11 ref.

Descriptors: *Snowpacks, *Ice, *Arctic, *Canada, *Radioactive dating, *Tracers, Radioactivity techniques, Stable isotopes, Radioisotopes, Deuterium, Tritium, Fallout, International Hydrological Decade, Oxygen isotopes.

Snow and ice samples have been collected on a traverse from the southeast to the northwest across Devon Island, North-West Territories, and analyzed for stable and radioactive isotopes: deuterium, oxygen-18, tritium, and total beta activities from atmospheric nuclear weapons testing. The snow samples consisted generally of one annual layer. The ice under the annual snow cover was sampled, and samples were also taken comprising up to three annual layers. Deuterium studies were useful to identify Baffin Bay as the major source of precipitation on the ice cap. The use of deuterium profiles for determining the accumulation rates was limited by the varying degree of melting of the deposits. This limitation applies in general also to the use of tritium profiles. However, at an elevation of 1800 m a characteristic tritium peak in the 1963/62 deposit was preserved because of lack of melting at this altitude during the summers of 1963 to 1965. Reference to this horizon allows the determination of the accumulation rate over the last decade. Total beta activities of fission products attached to particles in the snow were not so affected by melting. Therefore, this is a promising method for determining the accumulation rates over the past two decades. (See also W75-01522) (Knapp-USGS)
W75-01582

USE OF THERMOLUMINESCENT DOSIMETERS FOR STUDIES OF THE SNOW COVER,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
W. E. Grummitt, and F. A. Prantl.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 642-650, 1974. 1 fig, 3 tab, 10 ref.

Descriptors: *Snow surveys, *Instrumentation, *Radioactivity techniques, *Nuclear moisture meters, *Water equivalent, Snow cover, Snowpacks, International Hydrological Decade.
Identifiers: *Thermoluminescent dosimeters.

Thermoluminescent dosimeters may be used to determine the water equivalent of the snow cover by gamma ray attenuation measurements. Small lithium flouride detectors were placed at a convenient height of 1-2 meters above ground at the beginning of a study period, and collected afterwards to be read in the laboratory. Attenuation of gamma-radiation from point sources and natural background was studied. Background requires exposure times of several weeks. Point sources located at ground level allow much shorter exposure times. In general the source strength is chosen according to height of snow cover and length of observation period. Advantages of this system are cheapness, flexibility, easy monitoring, and simple field installation. Therefore it can serve a large number of observation stations. (Knapp-USGS)
W75-01583

STABLE ISOTOPES IN THE STUDY OF SNOW AND ICE RESOURCES,
Calgary Univ. (Alberta). Dept. of Physics.
H. R. Krouse.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 651-660, 1974. 3 fig, 34 ref.

Descriptors: *Stable isotopes, *Snow, *Ice, *Glaciohydrology, Tracers, Water balance, Precipitation(Atmospheric), Snowpacks, Snow surveys, Snowmelt, Streamflow, Stratified flow, Lakes, Deuterium, Oxygen isotopes, International Hydrological Decade.

Stable isotopic techniques are used to solve many problems in the study of snow and ice resources, using the most abundant isotopic species in water (0-16, deuterium, and 0-18). Their abundances are altered markedly in the hydrologic cycle because of their different vapor pressures. Potential uses and accomplishments of this technique include: differentiation of freshwater and sea ice; relating snow accumulations to meteorology, particularly in remote areas; elucidating water movement in snowpacks; evaluating snow and glacier runoff (stratified lakes); and elucidating the history and age is ice caps. Field studies, mainly from the Arctic, illustrate these concepts. (See also W75-01522) (Knapp-USGS)
W75-01584

DEVELOPMENT AND FIELD TESTING OF A REMOTE RADIOISOTOPIC SNOW GAGE,
JRB Associates Inc., La Jolla, Calif.
D. C. Shreve, and A. J. Brown.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 661-673, 1974. 9 fig.

Descriptors: *Snow surveys, *Water equivalent, *Nuclear moisture meters, *Instrumentation, Snowpacks, Radioactivity techniques, Gamma rays, Radioisotopes, International Hydrological Decade.

Detailed information about the location of the water throughout the snowpack can be obtained by measuring the attenuation of gamma radiation passing through the snow. The gage provides the water equivalent of the snowpack in each of ten vertical increments. Both a total water equivalent and a course vertical density distribution of the snowpack are obtained. The gage consists of two 18-ft high vertical masts separated by 25 inches. One of the masts houses five radioisotopic sources and the other six Gieger Muller detectors spaced at equal intervals up its length. Ten collimated beams of gamma rays are directed diagonally from the sources to the detectors in a zig-zag pattern. The attenuation produced in each of the beams yields the water equivalent in that vertical increment. The accuracy of the gage as compared to core sample measurements appears to be better than 10%. (See also W75-01522) (Knapp-USGS)
W75-01585

ANALYSIS OF SNOW DISTRIBUTION USING TERRESTRIAL PHOTOGRAMMETRY,
Institute of Hydrology, Wallingford (England).
K. Blyth, and R. B. Painter.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 679-687, 1974. 4 fig, 1 tab, 7 ref.

Descriptors: *Snow surveys, *Photogrammetry, *Snowpacks, *Flood forecasting, Cameras, Snow cover, Water equivalent, Water yield, Mapping, Data collections, Runoff forecasting, Flood forecasting, Terrain analysis, Monitoring, International Hydrological Decade.
Identifiers: United Kingdom(England).

Photogrammetry may be used to measure the depth of shallow snowpacks. An operational system for a research catchment is described, and the potential of terrestrial photogrammetry in flood warning systems is discussed. In the United Kingdom, Snowfall is confined to the period October-April, and typically depths are less than 1 meter. Apart from relatively small mountainous areas above some 1200 m altitude, the snowpack will accumulate and completely ablate several times during the winter. Terrestrial photogrammetry is a method by which the surface contours of an object are found by photographing it stereoscopically using ground-based cameras, and analyzing the photographs in a suitable stereo plotting machine. A feasibility study was carried out to establish whether terrestrial photogrammetry can be used to give areal estimates of snow depth, to find the errors involved, and to make recommendations on design practice for an operational network. Tests were made on a N.E. facing slope, over an area 300 m x 100 m, ranging in altitude from 460 to 525 meters. Photographs of this areas, first without snow and then with snow, were taken from each end of a 100 m base line, sited some 150 m from the near edge of the area, on the opposite side of the valley. A combination of terrestrial photogrammetry and telemetering snow pillows can produce significant benefits. Coupled with telemetering snow pillows, the water equivalent of a snowpack can be determined to better than 20%. (See also W75-01522) (Knapp-USGS)
W75-01586

CONCEPTUAL DESIGN OF A MULTIPURPOSE INSTRUMENT FOR WINTER STREAM METERING,
Canada Center for Inland Waters, Burlington (Ontario).
G. Tsang.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC. p 688-698, 1974. 4 fig, 6 ref.

Descriptors: *Stream gages, *Frazil ice, *Instrumentation, Tracers, Electrolytes, Discharge measurement, Ice, Velocity, Discharge(Water), International Hydrological Decade.

A multipurpose instrument was designed for winter stream metering. The instrument measures the flow velocity at a point in a stream, the concentration of frazil ice, and the velocity of the frazil ice. Measurement of the flow velocity is by releasing a small volume of conductive solution into the stream. The passing of the conductive water through two pairs of electrodes enables the measurement of the velocity of the flow. By releasing the conductive solution as a steady plume, the concentration of frazil ice is measured. The physical principle is that the current through two electrical poles decreases as nonconductive frazil ice passes through the gap. By switching the instrument to a low frequency pass, average concentration of frazil over a time period may be obtained. By recording the instantaneous frazil concentration at two points and measuring the time displacement of the two recordings, the velocity of the suspended frazil can be calculated. (See also W75-01522) (Knapp-USGS)
W75-01587

AN ELECTRO-OPTICAL INSTRUMENT FOR MEASURING TOTAL PRECIPITATION AND SNOW PACK WATER CONTENT,
Bass Engineering, Inc., San Diego, Calif.
J. C. Bass.
In: Advanced Cencepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 699-705, 1974. 6 fig, 4 ref.

Descriptors: *Precipitation gages, *Snowpacks, *Water equivalent, *Instrumentation, Telemetry, Data collections, Snowfall, Snow, Rain gages, Snow surveys.

A total precipitation gage is described for use in dual installations for the measurement of total precipitation and snowpack water content. The instruments use the optical lever principle designed for the field of oceanography as magnetometers, deep sea tide gages, and shallow water wave gages. A station for obtaining data from both a total precipitation gage and one or more snow pillows to measure snowpack water content can be built using a single sensor. The sensor has the range and resolution capability to cover the requirements of both systems. The advantage of such a system is that any errors introduced by using two different types of sensors can be eliminated. The system can be used with either local recording where the two readings would be multiplexed on the recorder or with a telemetry system. This system would require a delay of the order of 3 to 4 seconds between readings. (See also W75-01522) (Knapp-USGS)
W75-01588

MEASURING SNOWFALL, A CRITICAL FACTOR FOR SNOW RESOURCE MANAGEMENT,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard, R. E. Brewer, and A. Sullivan.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 706-715, 1974. 4 fig, 11 ref.

Descriptors: *Precipitation gages, *Snowfall, *Instrumentation, Winds, Calibrations, Forests, Water balance, Snowmelt, Runoff forecasting, Water equivalent, Snowpacks, International Hydrological Decade.

Under windy conditions the catch of snowfall by usual precipitation gages may be 80% in error. The catch of a gage placed in a manmade site shield untilizing the blow-fence design (the Wyoming Shield) can duplicate that of a gage placed within a forested opening. The advantages of the Wyoming Shield are that it is always uniform, not subject to the natural variations in timber protection, it provides freedom of choice for siting a gage, and it is relatively inexpensive. Unshielded gages catch from one-third to one-half the amount of precipitation that a well-protected gage in a forest opening catches. A gage with only a free swinging Alter-type shield catches from two-thirds to three-fourths the amount a well-protected gage catches, while a gage shielded with the Wyoming Shield configuration will catch about the same amount as a well-protected shield. (See also W75-01522) (Knapp-USGS)
W75-01589

THE SNOW MOISTURE INTEGRATOR,
Michigan Technological Univ., Houghton.
G. R. Alger, and H. S. Santeford.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 716-719, 1974. 1 fig, 2 ref.

Descriptors: *Water equivalent, *Snowpacks, *Snow surveys, *Instrumentation, *Precipitation gages, Snow, Evaporation, Precipitation(Atmospheric), Water balance, Water yield, International Hydrological Decade.

The Snow Moisture Integrator automatically measures and records changes in moisture content of a snow sample exposed to ambient weather conditions. Changes in moisture content resulting from additional snowfall, condensation onto the snow sample, or evaposublimation from the sample may be measured to 0.001 inches water equivalent. The device was field tested in the humid Lake Superior region of Upper Michigan and the much dryer alpine region of central Colorado. The utility of the device for measuring light snowfalls, evaposublimation losses, and condensation increases was shown at both installations. (See also W75-01522) (Knapp-USGS)
W75-01590

ELECTRONIC MEASUREMENTS OF SNOW SAMPLE WETNESS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. I. Linlor, and J. L. Smith.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 720-728, 1974. 4 fig, 2 ref.

Descriptors: *Snowpacks, *Instrumentation, *Moisture content, Water equivalent, Moisture meters, Electrical studies, International Hydrological Decade, Runoff forecasting, Snow surveys.

Several electronic methods can readily measure the wetness of snow. One method is based on the change in capacitance of a snow sample before and after freezing. The change is directly related to the amount of moisture initially present. Another is based on the losses in a resonating electrical circuit and depends on the amount of liquid-phase water in the snow being measured. Field tests for both systems were made to demonstrate the principles. Preliminary calibration curves are presented. A field unit is described that can obtain in situ values for snow wetness. (See also W75-01522) (Knapp-USGS)
W75-01591

MICROWAVE PROFILING OF SNOWPACK FREE-WATER CONTENT,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
W. I. Linlor, M. F. Meier, and J. L. Smith.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1983: National Academy of Sciences, Washington, DC, p 729-736, 1974. 3 fig, 4 tab, 4 ref.

Descriptors: *Snow surveys, *Snowpacks, *Moisture content, *Microwaves, *Instrumentation, Gamma rays, Nuclear moisture meters, Water equivalent, Runoff forecasting, International Hydrological Decade.

A microwave system is proposed to measure the amount of liquid-phase water in a snowpack. Attenuation of the beam between source and receivers is produced by the water in the snow. The relationships of frequency, distance, and volume percent of water are calculated for an assumed detector sensitivity, together with the estimated cost of a representative system. A laboratory test shows the attenuation for snow at maximum wetness. A configuration is proposed that involves a vertical tube containing microwave and radioactive sources and another vertical tube containing microwave and gamma detectors, so that density and wetness profiles are obtained simultaneously over essentially the same path. With both density and free-water profiles available, the condition of the snowpack can be accurately determined and, combined with meteorological information, useful predictions can be made regarding the melting and water discharge rates from snowpacks. (See also W75-01522) (Knapp-USGS)
W75-01592

METEOR BURST COMMUNICATION,
Boeing Co., Seattle, Wash.
R. E. Leader.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 737-747, 1974. 5 fig, 1 ref.

Descriptors: *Telemetry, *Data transmission, *Remote control, *Electronic equipment, Instrumentation, Hydrologic data, Data collections, International Hydrological Decade.
Identifiers: *Meteor burst communication.

Telemetry by Meteor Burst Communication technology may be used for remote data acquisition and control. This type of system is ideally suited for low data-rate telemetry in hydrological, meteorological, and oceanographic data sensing. Ionized trails in the upper atmosphere resulting from meteor bursts can be utilized to reflect or reradiate short VHF radio messages between stations located anywhere within 1200 miles. Reliable message exchange in excess of 100 per hour can be realized. A typical meteor burst system would consist of a base station transceiver and a central processor with a number of remote radio stations designed for data collection or external control. (See also W75-01522) (Knapp-USGS)
W75-01593

DIELECTRIC CONSTANTS IN THE MANAGEMENT OF FREEZING SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W75-01594

ELECTRICAL PARAMETERS OF SOME FROST-PRONE SOILS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2C.
W75-01595

MICROELECTRODES SUITABLE FOR USE IN CELLS WITH HIGH HYDROSTATIC PRESSURE,
State Univ. of New York Albany. Dept. of Biological Sciences.
M. C. Ernau.
Plant Physiol. 53(5): 772-774. Illus. 1974.
Identifiers: Agar, Cells, Chlorides, *Electrodes, Gelatin, *Hydrostatic pressure, *Mougeotia, *Nitella-translucens, Potassium, Algae.

Microelectrodes with a 1-2-micrometer tip diameter have been made, which are capable of withstanding plant cell hydrostatic pressure on impalement. Filling the electrodes with 1% agar or 5% gelatin in 2 M KCl prevents cytoplasmic contents from moving into the electrode tip on implalement and therefore prevents the irreversible increase in resistance which often occurs. The agar and gelatin electrodes were tested in 2 fresh water algae, Nitella translucens and Mougeotia sp., and the potentials recorded were found comparable to those recorded with standard 2 M KCl electrodes.--Copyright 1974, Biological Abstracts, Inc.
W75-01596

A METHOD FOR THE DETERMINATION OF THE CALORIC CONTENT OF SESTON, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
K. Von Broeckel.
Kiel Meeresforsch, Vol 29, No 1, 1973, Illus. English summary.
Identifiers: *Caloric content, Combustion, Fiber, Filters, *Germany(Kiel Bight), Glass, *Membrane filters, *Phytoplankton, *Seston, Methodology.

A method is described to determine the caloric content of particulate matter from water bottles and sediment traps. Samples are filtered on glass-

fiber filters (Whatman GF/C, 2.25 cm diameter) or on membrane filters (Sartorium, type SM 1130, 2.5 cm diameter). The filters are combusted in a Phillipson microbomb calorimeter. Benzoic acid dissolved in ethyl-alcohol is added to the glassfiber filters before combustion. This is not necessary for membrane filters as they are composed of explosive cellulose nitrate. The systematical error is 27.1%, and 9.6% for glassfiber filters and membrane filters respectively. Membrane filters with a pore size of 0.8 micrometers were most suitable. It is recommended to wash filters after filtration twice with 2-5 ml of distilled water. Glassfiber and membrane filters did not differ significantly with regard to the caloric content of the filtered matter. The retention of glassfiber filters was significantly higher than that of membrane filters, ($p1 < 2\%$ and $p2 < 0.1\%$) with regard to seston content (dry weight). A significant difference, ($p < 0.2\%$ with regard to seston and 0.1% with regard to caloric content) was found in the retention of filters if different amounts of water were filtered, (1 liter and 2 liter) and the results related to 1 liter of water. Therefore the same amount of water should always be used for filtration. The caloric aspect of the phytoplankton bloom in the spring of 1972 off Boknis Eck (Kiel Bight) (West Germany) is described and discussed. The caloric content of a phytoplankton population is a possible indication of its physiological state.--Copyright 1974, Biological Abstracts, Inc.
W75-01614

POSSIBILITIES OF THE 'CARBON ROD' TECHNIQUE FOR THE DETERMINATION OF TRACE ELEMENTS IN WATER BY ATOMIC ABSORPTION,
Rijksfaculteit der Landbouwwetenschappen, Ghent (Belgium).
For primary bibliographic entry see Field 5A.
W75-01619

INSTRUMENTATION FOR WATER QUALITY MONITORING,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5A.
W75-01620

AUTOMATED FLUID INJECTOR,
R. J. Harris.
United States Patent 3,824, 859. Applied February 16, 1973. Issued July 23, 1974. Official Gazette of the United States Patent Office, Vol 924, No 4, p 818-819, July, 1974. 1 fig.

Descriptors: *Patents, Water samples, *Automation, Fluids, Experimentation, Streams.
Identifiers: *Fluid injectors.

An apparatus was patented for accurately measuring and injecting quantities of fluid specimens, or samples, as received from a flowing sampled stream, into various media. Such media include a receptacle or inlet of a modern analytical instrument. The automatic fluid injector, or continuous flow analyzer, is comprised of: a support means; a tubular mounting member, generally mounted on the support means; a needle syringe, including a barrel and a plunger reciprocable within the barrel, and the bore of a needle for insertion into the axial opening; and an associated cylinder piston unit, the needle syringe of which is mounted on the forward end of the piston. Both the plunger of the syringe and piston of the cylinder piston unit are reciprocable. On actuation in response to automatic control means, they accurately measure, trap, and then inject fluid specimens from the flowing stream, as desired. (Praque-FIRL)
W75-01625

EXEMPLARY WATER LEVEL AND RUNOFF MEASURING DEVICES IN MOUNTAIN WATER STREAMS (VORBLIDLICHE WASSERSTANDS-UND ABELUSSMESSANLAGEN IN GEBIRGSWESSERN),
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 2E.
W75-01643

GENERALIZATION, TYPIFICATION, AND KINETIC ANALYSIS OF THE BIOCHEMICAL OXYGEN DEMAND CURVES BASED ON BOD-EXPERIMENTS (OBOBSHCHENIYE, TITIZATSIYA I KINETICHESKIY ANALIZ KRIVYKH POTREBLENIYA KISLORODA PO DANNYM BPK-OPYTOV),
For primary bibliographic entry see Field 5A.
W75-01647

SAMPLING INVERTEBRATES ACTIVE BELOW A SNOW COVER,
Bergen Univ. (Norway). Zoological Museum.
A. L. Steigen.
Oikos, Vol 24, No 3, p 378-376, 1973, Illus.
Identifiers: *Biomes(High mountain), *Invertebrates, *Sampling, *Snow cover.

A pitfall trap was designed for use under the snow in high mountain biomes. It consists of a collecting device to be mounted under the snow cover and a portable pump to empty the trap. A periscope is used in the field to confirm that the trap has been completely emptied. Laboratory tests show the method to be highly efficient.--Copyright 1974, Biological Abstracts, Inc.
W75-01649

7C. Evaluation, Processing and Publication

SCREENING MODEL FOR STORM WATER CONTROL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-01110

OPTIMAL WEIGHTING FUNCTION IN WATER QUALITY MODELING,
University of Southern California, Los Angeles. Dept. of Chemical Engineering; and University of Southern California, Los Angeles. Dept. of Electrical Engineering and Materials Science.
For primary bibliographic entry see Field 5B.
W75-01111

INSTANTANEOUS UNIT HYDROGRAPHS, PEAK DISCHARGES AND TIME LAGS IN URBAN BASINS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-01124

WATER RESOURCES DATA FOR KANSAS, 1973: PART 2. WATER QUALITY RECORDS,
Geological Survey, Lawrence, Kans.
A. M. Diaz, and C. D. Albert.
Data Report, 1973. 168 p, 2 fig, 5 tab, 20 ref.

Descriptors: *Data collections, *Water quality, *Kansas, Suspended load, Hydrologic data, Solutes, Sampling, Water pollution, Water temperature, Sediment load, Discharge(Water), Silica, Iron, Manganese, Calcium, Magnesium, Sodium, Potassium, Bicarbonates, Carbonates, Sulfates, Chlorides.

Water-resources data for the 1973 water year for Kansas include records of the chemical and physical characteristics of surface water and groundwater. Data on the quality of surface water (chemical, microbiological, temperature, and sediment) were collected from designated sampling sites at predetermined intervals such as once daily, weekly, monthly, or less frequently, and at some sites data were recorded on punched paper tape at 60-minute intervals. Records are given for 70 sampling stations of which 7 are partial-record stations, and for 51 miscellaneous sites. Miscellaneous temperatures of streamflow are given for 77 gaging stations, and records of chemical analyses are given for 224 groundwater sites. (Knapp-USGS)
W75-01160

THE ANCLOTE AND PITHLACHASCOTEE RIVERS AS WATER-SUPPLY SOURCES,
Geological Survey, Tallahassee, Fla.
R. W. Coble.
Florida Bureau of Geology, Tallahassee, Map Series No 61, 1973. 5 fig, 6 tab, 9 ref.

Descriptors: *Water resources, *Surface waters, *Florida, *Low flow, Base flow, Surface-groundwater relationships, Water supply, Withdrawal, Saline water intrusion, Hydrogeology.
Identifiers: *Anclote River(Fla), *Pithlachascotee River(Fla).

The Anclote and Pithlachascotee Rivers of Florida are suitable sources only for supplemental water supplies, which could be used in conjunction with groundwater supplies, and as sources of recharge water to the Floridan aquifer. At times, zero flow occurs at many places along these streams and their tributaries. At 90% duration the combined discharge at sites A-4 and P-4 is only 5.7 cfs. Major well fields in the southern part of the Anclote River basin are depleting that river during low flow. The Pasco County well field will deplete the Anclote, and the Starkey well field will deplete both the Anclote and the Pithlachascotee. During low flow, saltwater extends about 11 miles upstream from the coast in the Anclote River and 6 miles in the Pithlachascotee River. In order to withdraw fresh river water from points closer to the coast during low flow, saltwater barriers must be placed in the transition or saltwater zones. Upstream withdrawals of freshwater could result in the saltwater moving farther upstream during low flow. The river water in the freshwater zones usually meets quality standards for public water-supply sources; only occasionally have phenolic compounds, arsenic, and bacteria in objectional concentrations been detected. (Knapp-USGS)
W75-01164

HYDROGEOLOGY OF SOUTHEASTERN CONNECTICUT,
Geological Survey, Hartford, Conn.
R. L. Melvin.
Southeastern Connecticut Water Authority, Atlas Report, 1974. 6 sheets, 17 ref.

Descriptors: *Hydrogeology, *Maps, *Model studies, *Connecticut, Water wells, Water yield, Surface-groundwater relationships, Induced infiltration, Water management(Applied), Alluvium, Alluvial channels.

The only aquifers in southeastern Connecticut capable of large-scale development of groundwater are deposits of stratified drift that are composed predominantly of sand and gravel. Commonly these aquifers are hydraulically connected to adjacent streams and for purposes of hydrologic analysis and water management are considered as stream-aquifer systems. The objectives of this study were (1) to collect and analyze the data necessary to define the hydrogeologic characteristics of the stratified drift and (2) estimate by the use of analytical models the amount of water that could be withdrawn by wells from stream-aquifer systems on a sustained basis. Under water-management schemes prevalent in Connecticut groundwater withdrawal rates are reasonably constant throughout the year or higher in the summer. Furthermore, the water withdrawn is not returned

to the aquifer or to the stream traversing the aquifer. Under such a management scheme, the quantity of water potentially available over a long period is limited to the natural aquifer recharge from precipitation plus the recharge that can be induced to infiltrate from adjacent streams. Withdrawal of quantities of water under the present management scheme would eliminate flow in a stream hydraulically connected to an aquifer approximately 10 percent of the time in an average year but would not result in a long-term decrease in groundwater storage. (Knapp-USGS)
W75-01165

WATER RESOURCES OF THE MILFORD AREA, UTAH, WITH EMPHASIS ON GROUND WATER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-01168

GROUND-WATER RESOURCES OF THE LOWER BEAR RIVER DRAINAGE BASIN, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W75-01169

GROUND-WATER HYDROLOGY OF THE HOLLISTER AND SAN JUAN VALLEYS, SAN BENITO COUNTY, CALIFORNIA, 1913-68,
Geological Survey, Menlo Park, Calif.
C. Killburn.
Open-file report, August 31, 1972. 44 p, 15 fig, 5 tab, 36 ref.

Descriptors: *Hydrogeology, *Water resources, *California, *Groundwater basins, Aquifers, Withdrawal, Groundwater movement, Water quality, Water yield, Irrigation water.
Identifiers: *Hollister Valley(Calif), *San Juan Valley(Calif).

Groundwater hydrology was studied in the Hollister and San Juan Valleys, within the Gilroy-Hollister groundwater basin, California. That part of the groundwater basin underlying the valleys consists of three subbasins each of which contains two or more groundwater subunits. The subbasin and subunit boundaries are formed by faults, folded sedimentary rocks, and igneous rocks. The principal water-bearing units are lenticular beds of sand and gravel interbedded with clay, silt, sand, and gravel, or their locally consolidated equivalents, which range from Pliocene to Holocene in age. Groundwater occurs mainly under artesian or semiartesian conditions but also under unconfined (water-table) conditions in areas adjacent to most surface streams and, locally, under perched or semiperched conditions. In 1968 the depth to water in wells ranged from approximately 20 feet above land surface to more than 200 feet below land surface. Withdrawals of groundwater for irrigation began in 1878. Since that time water levels in wells have declined more than 180 feet in the Hollister Valley and more than 100 feet in the San Juan Valley. Serious declines began after 1945. Groundwater quality is good except in the eastern part of the Hollister Valley where it locally contains objectionable concentrations of boron and chloride. (Knapp-USGS)
W75-01173

GROUND WATER IN HASKELL COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Reston, Va.
E. D. Gutentag, and L. E. Stullken.
Available from USGS, 1200 S. Eads St., Arlington, Va. 22202. Price $1.25 per set. Hydrologic Investigations Atlas HA-515, 1974. 2 sheets, 9 fig, 4 tab, 11 ref.

Descriptors: *Water resources, *Kansas, *Groundwater, *Hydrogeology, Alluvium, Water levels, Data collections, Hydrologic data, Water wells, Irrigation water.
Identifiers: *Haskell county(Kansas).

The hydrogeology of Haskell County, Kansas is described in a 2-sheet hydrologic atlas. Unconsolidated alluvial deposits of Tertiary and Quaternary age are the principal aquifer in most of Haskell County. These deposits consist of clay, silt, sand, and gravel that affect the water-yielding capacity and degree of confinement within the aquifer. The thickness of saturated deposits, shown by pattern on the hydrologic map, ranges from about 250 to 400 feet with an average thickness of 330 feet. About 500 wells, most of which were used for irrigation, were in use in January 1970. Well yields of 1,000 to 2,500 gpm are available everywhere in the county if the full saturated thickness of the unconsolidated deposits is penetrated. Well yields of 500 to 2,500 gpm are available from depths of 200 feet or less in the northern and eastern parts of the county. Loess of late Pleistocene age underlies most of the county; the soil formed on the loess is ideally suited for farming. Dune sand of late Pleistocene age underlies part of the northern township of the county and is suitable for rangeland or irrigation by sprinkler systems. Quaternary alluvium underlies the flood plain of the Cimarron River. Consolidated rocks range in age from Permian to Cretaceous. The sandstone aquifer includes the Upper Jurassic and Lower Cretaceous rocks in Haskell County. The lithology of these formations differs within short distances and individual units are difficult to trace. The sandstones commonly yield less than 300 gpm but uncemented zones may yield more than 1,000 gpm to wells. (Knapp-USGS)
W75-01174

WATER RESOURCES OF WISCONSIN, TREMPEALEAU-BLACK RIVER BASIN,
Geological Survey, Washington, D.C.
H. L. Young, and R. G. Borman.
For sale by USGS, 1200 S. Eads St., Arlington, Va. 22202. Price $1.25 per set. Hydrologic Investigations Atlas HA-474, 1973. 4 sheets, 53 ref.

Descriptors: *Water resources, *Wisconsin, *Surface waters, *Groundwater, *Mississippi River basin, Water yield, Water quality, Discharge(Water), Maps, Streamflow, Hydrogeology, Hydrologic data.
Identifiers: *Trempealeau-Black River basin(Wisc).

Large amounts of good quality water are available in much of the Trempealeau-Black River basin, Wisconsin. Groundwarer is more widespread than surface water and, except for hydroelectric and thermoelectric power generation, groundwater is used more extensively. It is available from the sand and gravel aquifer and the sandstone aquifer, both of which commonly yield 1,000 gpm to wells in some areas. Most municipalities and industries, except in the northeast, have adequate supplies of groundwater available for growth and development. In the northeast these aquifers are thin or missing, and domestic well yields are very low, some less than 1 gpm. Streamflow in the basin is generally dependable, but the geologic conditions causing poor groundwater availability in the northeast also cause small low flows. Floods in the basin are infrequent except on the Mississippi River, where damages are sometimes severe. Small farm ponds, navigation pools on the Mississippi, and flowages for cranberry bogs comprise most of the drainage impoundments in the basin. There are few natural lakes. The quality of both groundwater and surface water in the basin is generally good except for hardness and iron. Neither surface nor groundwater is significantly contaminated. Very little of the available water in the basin is withdrawn for man's use. Of the 31.6 inches of average annual precipitation on the basin, 8.3 inches (710 billion gallons) leaves the basin as streamflow. This runoff represents the theoretical yield of the basin that is available for use. In addition, about 6,000 billion gallons per year are available in the Mississippi River. (Knapp-USGS)
W75-01175

RECONNAISSANCE OF THE WATER RESOURCES OF THE ARDMORE AND SHERMAN QUADRANGLES, SOUTHERN OKLAHOMA,
Geological Survey, Oklahoma City, Okla.
D. L. Hart, Jr.
Oklahoma Geological Survey, Norman, Hydrologic Atlas 3, 1974. 4 sheets, 7 ref.

Descriptors: *Water resources, *Groundwater, *Oklahoma, Hydrogeology, Water yield, Hydrologic data, Maps, Geologic mapping.
Identifiers: *Ardmore(Okla), *Sherman(Okla).

This reconnaissance appraisal of the water resources of the Ardmore quadrangle of Oklahoma and the Oklahoma portion of the Sherman quadrangle is presented as a 4-sheet hydrologic atlas. Geologic structure affects the occurrence of groundwater in the Arbuckle Plains and Arbuckle Hills areas, where several large springs and flowing wells occur areas of faulted rock. The faults apparently act as conduits through which water travels to the surface at some places and acts as a barrier to the movement of water at other places. The explanation for the geologic maps describes briefly the rock types and water-yielding characteristics. The maps show the surface exposures of the most favorable aquifers in the quadrangles. Groundwater in sufficient quantities for domestic use is available throughout most of the area. In many areas, yields of several hundred gallons per minute are common. In a few isolated localities, however, even small amounts of water of suitable quality are difficult to obtain. In general, the most favorable areas are the alluvium and terrace deposits along the major rivers and the thick, fractured and cavernous limestones in the Arbuckle Hills and Arbuckle Plains areas. Potential for development of water supplies in the report area is good. Several major aquifers are capable of producing much larger quantities of water than are presently being pumped, and the development of springs could provide additional water supplies. (Knapp-USGS)
W75-01176

WATER-TABLE DECLINE IN THE ALLUVIAL AQUIFER, SPRING 1964 TO SPRING 1974, UPPER BLACK SQUIRREL CREEK BASIN, COLORADO,
Geological Survey, Pueblo, Colo.
D. L. Bingham, and J. M. Klein.
Open-file map, 1974. 1 sheet, 1 map.

Descriptors: *Water levels, *Maps, *Colorado, Withdrawal, Aquifers, Groundwater, Hydrologic data.
Identifiers: El Paso County(Colo).

Data that were collected from 1964 to 1974 in the upper Black Squirrel Creek basin, El Paso County, Colo., show declines in groundwater levels in the alluvial aquifer of 10 feet or more in an 18-square-mile area and declines of 30 to 46 feet in a 6-square-mile area. Present trends indicate a continued lowering of the water level. The decline is shown on a map of the area. (Knapp-USGS)
W75-01177

AN INVENTORY OF PUBLISHED AND STORED CHEMICAL ANALYSES OF SURFACE WATER IN CALIFORNIA, 1906-71,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W75-01178

WATER IN THE METHOW RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.

For primary bibliographic entry see Field 4A.
W75-01181

DRAINAGE AREAS OF STREAMS IN ARKANSAS, WHITE RIVER BASIN,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 2E.
W75-01183

WATER AND AIR MOVEMENT IN BOUNDED LAYERED SOIL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-01204

A STUDY TO PREDICT THE EFFECTS OF THERMAL ADDITIONS IN THE BAY RIVER AND NEUSE RIVER AREA OF NORTH CAROLINA,
Research Inst. of the Gulf of Maine, Portland.
For primary bibliographic entry see Field 5C.
W75-01208

MODELING AND OPTIMIZATION OF WATER RESOURCES SYSTEMS --- PHASE III, STOCHASTIC MODELING AND OPTIMIZATION OF THE WALNUT AND POTEAU RIVER BASINS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 4A.
W75-01210

COMPUTER MEMORY REQUIREMENTS FOR DP AND DDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01212

COMPUTER TIME REQUIREMENTS FOR DP AND DDDP IN WATER RESOURCES SYSTEMS ANALYSIS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01213

A WATER BALANCE ASSESSMENT OF THE NEW ZEALAND RAINFALL,
New Zealand Meteorological Service, Wellington.
For primary bibliographic entry see Field 2A.
W75-01305

SURVEY OF NEW ZEALAND TANK EVAPORATION,
New Zealand Meteorological Service, Wellington.
For primary bibliographic entry see Field 2D.
W75-01307

RIVER MILEAGE TABULATIONS FOR THE COLORADO RIVER BASIN. COMMUNITIES AND MAJOR TRIBUTARIES.
Public Health Service, Denver, Colo. Div. of Water Supply and Pollution Control.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-229 834, $3.25 in paper copy, $2.25 in microfiche. February 1962. 19 p, 3 fig, 2 tab.

Descriptors: *Colorado River Basin, *Data collections, *Tributaries, Colorado river, Distance, Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, River systems, Junctions, *River basins.
Identifiers: *River mileage, Towns.

A method of indexing points along the Colorado River and its tributaries which has been adopted as a standard river mileage location system was presented. This mileage system is essentially the same as that used in '1957 Inventory-Municipal and Industrial Waste Facilities', published by the U.S. Public Health Service. Main-stem and other mileages were taken wherever possible from the series of river survey maps published by the U.S. Geological Survey. Other river mileages were obtained by means of a map measurer, using the most recent topographic maps available. River mileages for a number of communities by state, including county and sub-basin designations were tabulated. River mileages at the confluence of major tributaries and sub-tributaries of the river system were also tabulated. (Humphreys-ISWS)
W75-01309

AUSTRALIAN REPRESENTATIVE BASINS PROGRAMME--PROGRESS 1973.
Australian Water Resources Council, Canberra.
Hydrological Series No 8, 1974. 47 p, 3 tab, 15 ref, 2 append.

Descriptors: *River basins, *Australia, *Water resources development, Programs, Administration, Planning, Organizations, Administrative agencies, Evaluation, Watersheds(Basins), Hydrologic data, Hydrologic aspects, Networks, Model studies.

The Australian Representative Basins Program is a coordinated study of the hydrology of some 93 Australian catchments, selected to be representative of the most typically occurring complexes of climate, geology, landform, soils, and vegetation in the Australian environment. The aim of the Program is to collect and analyze data to improve quantitative understanding of the water balance in Australian catchments, with the following specific objectives: (1) national water resources assessment, by improved interpolation between gauged catchments in the Australian stream gauging network; (2) improved basis for design of engineering structures (dams and weirs, road and railway bridges, and culverts) in ungauged catchments; (3) prediction of the hydrologic effects of changes in land use and management; and (4) provision of a bank of hydrological data which will be of fundamental importance to ecological and environmental studies. The development of the Representative Basins Program was outlined and the organization responsible for its operation was described. (Humphreys-ISWS)
W75-01310

STREAM GAUGING INFORMATION, AUSTRALIA--SUPPLEMENT 1972.
Australian Water Resources Council, Canberra.
Australian Government Publishing Service, Canberra, Publication ISBN 0 642 501289, 1974. 55 p, 12 tab.

Descriptors: *Gaging stations, *River basins, *Australia, Networks, Stations, Surface waters, *Data collections, Gaging, Stream gages, Sites, Instrumentation.

The report is the third supplement to Stream Gauging Information, Australia, December 1969. It contains changes and additions to the stream gauging network during the 12-month period ending December 31, 1972, and it is intended for use in conjunction with the main catalogue. During 1972 a total of 204 new stations were established throughout Australia. This number of new stations includes 20 stations installed for other purposes than stream gauging, mainly flood warning. Included are 84 stations which were omitted in previous publications and 11 re-established stations. Thirty seven stations have been equipped with superior instruments and are listed as upgraded stations. Seventy-eight stations have been discontinued for various reasons. Details of all variations were listed and separate summaries provided information on classification of stations, type of gauges installed and organizations operating stream gauging stations. (Humphreys-ISWS)
W75-01311

ANALOG SUBROUTINES FOR THE FINITE ELEMENT METHOD,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 4B.
W75-01320

DIGITAL SIMULATION LANGUAGE FOR DISTRIBUTED PARAMETER SYSTEM IDENTIFICATION,
California Univ., Los Angeles. Dept. of Computer Science.
W. C. Tam.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 532, $7.25 in paper copy, $2.25 in microfiche. PHD Thesis, 1972, 197 p. OWRT B-150-CAL(4).

Descriptors: *Programming languages, Digital computers, Mathematical models, *Model studies, Design criteria, Computer programs.
Identifiers: Distributed parameter system identification.

The language PDEL-ID (Partial Differential Equation Language-Identification) has been designed to provide a convenient tool for the identification of distributed parameter systems. It is a superset of PDEL, which is a language designed for analysis, and thus is suitable for both distributed parameter system identification and analysis. The program generated by PDEL-ID is divided into four regions: (1) the initial region, (2) the identification region, (3) the dynamic region, (4) the terminal region. Such a design is closely related to the structure of a general simulation process. Four major language facilities are provided by the implemented PDEL-ID system. They are: (1)) System model specifications, (2) Observation data input, (3) Parameter identification, (4) Print-out control. All these facilities are designed to have maximum generality and flexibility. The language is applied to six practical distributed parameter system identification problems. The solutions of these problems demonstrate the capabilities of PDEL-ID to identify distributed system parameters which can be nonuniform, time-varying or nonlinear, plus unknown initial and/or boundary conditions. (Snyder-California, Davis)
W75-01321

MAP SHOWING CHLORIDE-ION CONCENTRATION IN SEDIMENTARY ROCKS OF PERMIAN (GUADALUPIAN) AGE, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss.
Open-file report, March 1974. 1 sheet.

Descriptors: *Chlorides, *New Mexico, *Groundwater, Aquifers, Leaching, Brines, Saline Water, Water quality, Maps, *Texas.

This map depicts the quality of water in aquifers in the Guadalupian Series of rocks in New Mexico. Groundwater contains relatively high concentrations of chloride ions (10,000 to more than 150,000 milligrams per liter) on the Northwest Shelf northwest of Hobbs, New Mexico; on the Central Basin platform; and in the Delaware basin. Groundwater contains relatively low chloride-ion concentrations (less than 10,000 milligrams per liter) in the Capitan aquifer, the San Andres Limestone, and the Artesia Group along the margins of the Delaware basin and at the north and south ends of the Central Basin platform. The quality of groundwater in the western part of the Permian basin is primarily controlled by hydraulic conductivity of the aquifer and the proximity to the outcrop. Leaching of soluble minerals from the Guadalupian Series at the surface has enhanced the hydraulic conductivity where these rocks are exposed west of the Pecos River on the

Northwestern Shelf and in the Guadalupe Mountains. Along the western and southern edges of the Permian basin, freshwater has replaced saline water in the aquifer proportional to the hydraulic conductivity of the aquifers. Relatively fresh water may be found resting upon saline water, as in the general case west of the Pecos River between Artesia and Carlsbad, or it may be encountered in situations where it is overlain and surrounded by more saline water. Throughout the area, water with a relatively low salinity can be found interfingering with water that is relatively high in salinity. This relationship is a dependable qualitative indicator of the relative differences in hydraulic conductivity of the rocks. (Knapp-USGS)
W75-01352

OPTICAL DATA PROCESSING AND PROJECTED APPLICATIONS OF THE ERTS-1 IMAGERY COVERING THE 1973 MISSISSIPPI RIVER VALLEY FLOODS,
Geological Survey, Reston, Va. EROS Program Office.
For primary bibliographic entry see Field 7B.
W75-01361

FLOOD INUNDATION IN THE SOUTHEASTERN UNITED STATES FROM AIRCRAFT AND SATELLITE IMAGERY,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 7B.
W75-01363

DATA FOR SELECTED WATER WELLS, YOUNTVILLE QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. F. Svitek.
Open-file report, 1973. 45 p, 6 tab.

Descriptors: *Groundwater, *California, *Basic data collections, *Water wells, Water yield, Water levels, Water quality, Hydrologic data.
Identifiers: Yountville(Calif), Napa County(Calif).

Data are tabulated for 93 selected water wells in the Yountville quadrangle, Napa County, California. These data were collected in connection with a water-resources appraisal of Napa Valley. Estimates of pumpage are also tabulated. (Knapp-USGS)
W75-01366

DATA FOR SELECTED WATER WELLS, NAPA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader, and J. F. Svitek.
Open-file report, 1973. 33 p, 6 tab.

Descriptors: *Groundwater, *California, *Basic data collections, *Water wells, Water yield, Water levels, Water quality, Hydrologic data.
Identifiers: Napa County(Calif).

Data are tabulated for 63 selected water wells in the Napa quadrangle, Napa County, California. These data were collected in connection with a water-resources appraisal of Napa Valley. Estimates of pumpage are also tabulated. (Knapp-USGS)
W75-01367

DATA FOR SELECTED WATER WELLS, CALISTOGA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. F. Svitek, and J. S. Bader.
Open-file report, 1973. 36 p, 6 tab.

Descriptors: *Groundwater, *California, *Basic data collections, *Water wells, Water yield, Water levels, Water quality, Hydrologic data.
Identifiers: Calistoga(Calif), Napa County(Calif).

Data are tabulated for 58 selected water wells in the Calistoga quadrangle, Napa County, California. These data were collected in connection with a water-resources appraisal of Napa Valley. Estimates of pumpage are also tabulated. (Knapp-USGS)
W75-01368

DATA FOR SELECTED WATER WELLS, RUTHERFORD QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader, and J. F. Svitek.
Open-file report, 1973. 75 p, 6 tab.

Descriptors: *Groundwater, *California, *Basic data collections, *Water wells, Water yield, Water levels, Water quality, Hydrologic data.
Identifiers: Rutherford(Calif), Napa County(Calif).

Data are tabulated for 117 selected water wells in the Rutherford quadrangle, Napa County, California. These data were collected in connection with a water-resources appraisal of Napa Valley. Estimates of pumpage are also tabulated. (Knapp-USGS)
W75-01369

DATA FOR SELECTED WATER WELLS, ST. HELENA QUADRANGLE, NAPA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader, and J. F. Svitek.
Open-File report, 1973. 20 p, 6 tab.

Descriptors: *Groundwater, *California, *Basic data collections, *Water wells, Water yield, Water levels, Water quality, Hydrologic data.
Identifiers: St. Helena(Calif), Napa County(Calif).

Data are tabulated for 22 selected water wells in the St. Helena quadrangle, Napa County, California. These data were collected in connection with a water-resources appraisal of Napa Valley. Estimates of pumpage are also tabulated. (Knapp-USGS)
W75-01370

EUTROPHICATION: A MATHEMATICAL MODEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5C.
W75-01385

MASS BALANCE AND ECONOMIC MODELS,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 6A.
W75-01388

TWO DIMENSIONAL STOCHASTIC MODEL OF A HETEROGENEOUS GEOLOGIC SYSTEM,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-01399

ADVANCED CONCEPTS AND TECHNIQUES IN THE STUDY OF SNOW AND ICE RESOURCES.
For primary bibliographic entry see Field 2C.
W75-01522

SNOW LOAD ANALYSIS AND RECREATIONAL USES OF SNOW DATA,
Soil Conservation Service, Reno, Nev.
For primary bibliographic entry see Field 2C.
W75-01523

SNOWPACK AND RELATED TRENDS IN MOUNTAINS OF THE SOUTHWESTERN UNITED STATES,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
For primary bibliographic entry see Field 2C.
W75-01524

POLAR REGION SNOW STRATIGRAPHY TECHNIQUES APPLIED TO COMMERCIAL PROBLEMS,
Mitre Corp., Bedford, Mass.
For primary bibliographic entry see Field 2C.
W75-01525

NEW CONCEPTS IN SNOW SURVEYING TO MEET EXPANDING NEEDS,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
For primary bibliographic entry see Field 7B.
W75-01526

LONG-RANGE GOAL AND INFORMATION NEEDS OF THE COORDINATED SNOW SURVEY PROGRAM IN CALIFORNIA,
California Cooperative Snow Surveys, Sacramento. Dept. of Water Resources.
A. J. Brown.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 47-54, 1974.

Descriptors: *Snow surveys, *California, *Runoff forecasting, Automation, Telemetry, Remote sensing, Planning, Snowpacks, Hydrologic data, Data collections, International Hydrological Decade.

The product of the snow survey program in California is the water supply forecast. This forecast provides the water manager with advance information about the probable basin runoff. The proposed long-range goal for the California Cooperative Snow Surveys Program is to develop the capability of rapid forecasts. Rapid forecasts would be made at any time upon request from a cooperator. To achieve the end product of a rapid forecast will require onsite sensors capable of relaying data to a central computer. Other disciplines can help the snow surveys and forecasting activities in such areas as new ways to measure snow, new instrumentation that is accurate and dependable, newer and easier methods of field installations, new concepts on where snow courses and sensor sites should be located, better use of satellite communications, and improvement of forecasting methods and techniques. (See also W75-01522) (Knapp-USGS)
W75-01527

THE I.H.D. WORLD GLACIER INVENTORY,
Department of the Environment, Ottawa (Ontario). Glaciology Div.
For primary bibliographic entry see Field 2C.
W75-01541

SURFACE MEASUREMENTS OF SNOW AND ICE FOR CORRELATION WITH DATA COLLECTED BY REMOTE SYSTEMS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 7B.
W75-01548

A DATA COLLECTION AND REDUCTION SYSTEM FOR SNOW ACCUMULATION STUDIES,
Department of the Environment, Ottawa (Ontario) Glaciology Div.
G. J. Young.

In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 304-313, 1974. 7 fig, 1 tab, 12 ref.

Descriptors: *Data collections, *Data processing, *Snowpacks, *Mapping, Computer programs, Model studies, Sampling, Snowmelt, Runoff forecasting, Canada, Terrain analysis, Discharge(Water), Streamflow forecasting, International Hydrological Decade.

Maps of snow accumulation may be compiled from irregularly spaced sampling locations. In generating the distribution maps, use is made of associations between snow depth and terrain characteristics. A grid square technique is employed to describe terrain characteristics. Altitudes at grid line intersections are used to generate measures of surface slope, azimuth and local relief; these characteristics are then used to stratify the area and select field sampling locations. Relationships are obtained between terrain characteristics and snow depth values at sampling locations and are applied to each grid point in turn to produce an areal summary of snowpack depth. The grid square technique is particularly powerful for computer operations making summation and mapping procedures fast and simple. It is sufficiently flexible that it can be applied with little modification to any area. A standardization data bank structure and the high speed of data reduction make the method suitable for real time studies of melting or as an independent check on other snow accumulation models. (See also W75-01522) (Knapp-USGS)
W75-01550

ESTIMATING TRUE BASIN SNOWCOVER,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 2C.
W75-01551

THE COMPUTER AS AN AID IN AVALANCHE HAZARD FORECASTING,
Avalanche Control Consultants, Olympia, Wash.
L. Miller, and D. Miller.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 356-362, 1974.

Descriptors: *Avalanches, *Forecasting, *Computer programs, Weather forecasting, Meteorological data, Weather data, Snowpacks, Regression analysis, Snow management, International Hydrological Decade.
Identifiers: *Avalanche forecasting.

Daily weather and avalanche observations are used in studies of mathematical models for avalanche hazard forecasting. Observational systems, data accumulation, and computer technology are combined to forecast and plan snow and ice avalanche control for winter recreation and transportation. Preliminary results indicate that rapid, accurate forecasts can be made with the use of a selective regression program. Forecasting programs are run for 24-hour forecasts. Programs for continuous storm periods are being developed. (See also W75-01522) (Knapp-USGS)
W75-01555

ICE INFORMATION COLLECTION, DISSEMINATION AND USES ON THE GREAT LAKES,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
F. H. Quinn.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, DC, p 363-369, 1974. 2 tab, 3 ref.

Descriptors: *Great Lakes, *Lake ice, *Iced lakes, *Data collections, Information exchange, Data transmission, Forecasting, Hydrologic data, Meteorological data.

Data collected in Great Lakes ice programs include ice type and thickness measurements, aerial and satellite imagery, time lapse photography, and ice movement measurements. The overall purpose is to provide reconnaissance information and detailed scientific data on the formation, type, movement and decay of ice in the Great Lakes. The waters of the Great Lakes are affected by ice conditions for approximately 4 months each year. These conditions influence navigation and power production in the lakes and connecting channels as well as contribute to the natural regulation of the Great Lakes system. The information that is necessary for operational requirements such as ice forecasts and vessel routings is transmitted to an Ice Navigation Center which disseminates the data to the various users. The ice information that is used for scientific studies such as ice forecast development, geochemical and petrographic analysis, and winter navigation problems is archived at the Lake Survey Center in Detroit. (See also W75-01522) (Knapp-USGS)
W75-01556

APPLICATION OF SATELLITE VISIBLE AND INFRARED DATA TO MAPPING SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, C. J. Bowley, D. T. Chang, and J. H. Willand.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 467-476, 1974. 2 fig, 7 ref.

Descriptors: *Ice cover, *Sea ice, *Infrared radiation, *Remote sensing, *Satellites(Artificial), Mapping, Surveys, Data collections, International Hydrological Decade.
Identifiers: ERTS.

High-resolution, multispectral data from ERTS-1 (Earth Resources Technology Satellite) were tested for mapping arctic sea ice. Ice features were mapped in the eastern Beaufort Sea and the Bering Sea during the 1973 spring season. ERTS imagery has a high potential for monitoring ice conditions during the time of maximum ice extent and the beginning of the ice breakup season. Examples of the application of satellite thermal IR data for detecting ice are discussed. The combined use of IR and visible data may provide more information on ice conditions than can be deduced from either type of data alone. During periods of alternating daylight and darkness a relationship exists between the diurnal variation in IR temperature and ice thickness. (See also W75-01522) (Knapp-USGS)
W75-01566

APPLICATION OF THERMAL IMAGERY TO THE DEVELOPMENT OF A GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. J. Schertler, C. A. Raquet, and R. A. Svehla.
In: Advanced Concepts and Techniques in the Study of Snow and Ice Resources--An Interdisciplinary Symposium, held at Monterey, California, December 2-6, 1973: National Academy of Sciences, Washington, D.C., p 513-522, 1974. 4 fig, 4 ref.

Descriptors: *Remote sensing, *Lake ice, *Great Lakes, *Infrared radiation, Satellites(Artificial), Surveys, Aircraft, Ice cover, Iced lakes, Monitoring, Mapping, Aerial photography, Data collections, International Hydrological Decade.

Thermal infrared imagery can be employed to delineate the relative thicknesses of various regions of freshwater ice as well as differentiate new ice from both open water areas and thicker (young) ice. Thermal imagery is generally superior to visual and SLAR imagery for estimating relative ice thicknesses and delineating open water from new ice growth. In a real-time Great Lakes Ice Information System, thermal imagery can not only provide supplementary imagery but also aid in developing interpretative methods for all-weather SLAR imagery, as well as establish the areal extent of spot thickness measurements. (See also W75-01522) (Knapp-USGS)
W75-01571

STABLE ISOTOPES IN THE STUDY OF SNOW AND ICE RESOURCES,
Calgary Univ. (Alberta). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W75-01584

METEOR BURST COMMUNICATION,
Boeing Co., Seattle, Wash.
For primary bibliographic entry see Field 7B.
W75-01593

PIPELINE NETWORK CALCULATIONS USING SPARSE COMPUTATION TECHNIQUES,
Northwestern Univ., Evanston, Ill.
For primary bibliographic entry see Field 8A.
W75-01626

8. ENGINEERING WORKS

8A. Structures

STORM DRAINAGE SYSTEM DESIGN AND NEW CITY PLANNING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
A. J. Bonham.
Institution of Engineers, Australia, Civil Engineering Transactions Vol CE16, No 1, p 67-70, 1974. 8 fig, 17 ref.

Descriptors: *Urban drainage, *City planning, *Flood protection, *Drainage systems, Storm drains, Urban runoff, Cities, Land use, Recreation facilities, Flood plains, Flood control, Design, Valleys, Natural streams, Gradients(Streams).

The design of major storm drainage systems, particularly major open channels, calls for a design strategy fully integrated with other aspects of city planning. If the new city (or major extension of an existing city) is large, then considerable areas of public open space will be required for various purposes. Some of these spaces can be accommodated on well designed flood plains giving a high degree of flood protection to adjacent built-up areas, and also preserving the environmental quality of the valley. An illustrated discussion is provided of the characteristics of mature graded streams in valley tract, and of the ways in which these can be utilized in draining urban catchments. Three designs, for different stream slopes and catchment areas are given in detail. (CSIRO)
W75-01253

AN ASSESSMENT OF REMOTE SENSING APPLICATIONS IN HYDROLOGIC ENGINEERING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 7B.
W75-01312

PIPELINE NETWORK CALCULATIONS USING SPARSE COMPUTATION TECHNIQUES,
Northwestern Univ., Evanston, Ill.
R. S. H. Mah.
Chemical Engineering Science, Vol 29, No 7, p 1629-1638, 1974. 8 fig, 10 ref.

Descriptors: *Pipelines, *Algorithms, *Construction, Computation, Computers, Model studies, Data processing, Networks.

Computation to determine steady-state conditions in pipeline networks can be facilitated using sparse computation techniques. Three network algorithms for direction assignment, node-arc ordering and construction of a minimal length cycle set are given. These algorithms are readily implemented using list processing techniques, making it unnecessary for program users to supply similar information. Using these algorithms, it is possible to obtain substantial reduction in computing time and core storage. Computational accuracy may also be enhanced by reduced number of rounding errors. The reduction of computing time is particularly dramatic. Estimates based on operation counts are partially verified by actual computational experience. For a given network and benefit of a single application of these algorithms is multiplied many times with iterations and different parametric values. The development demonstrates substantial advantages of applying graph-theoretic techniques directly to increase data processing efficiency. (Murphy-FIRL)
W75-01626

DRAIN CONSTRUCTION UNDER HIGH GROUNDWATER LEVEL CONDITIONS (O STROITEL 'STVE DRENAZHA V USLOVIYAKH VYSOKOGO URONNYA GRUNTOVYKH VOD),
B. M. Kaziyev.
Gidrotekhnika i Melioratsiya, No 2, p 81-82, 1974.

Descriptors: *Groundwater, Draining, *Sewerage, Treatment facilities.
Identifiers: *Cave-ins.

Factors influencing the cave-in of trench walls in areas with high groundwater level were studied. In most cases, cave-in did not extend over the entire depth of the trench, but started out from the depth with the highest moisture content. In relatively dry sections, cave-in extended over the entire height, and was often preceeded by cracks parallel to the trench wall. Cave-in was found to be conditioned by the non-linear motion of the excavator. Also, cave-in occurred most frequently on the side of the spoil bank. (Takacs-FIRL)
W75-01629

INVESTIGATION OF THE OPTIMAL LIFE OF FIXED CAPITAL IN WATER SUPPLY AND SEWER SYSTEMS (AZ ALLOESZKOZOK OPTIMALIS ELETTARTAMANAK VIZSGALATA A VIZELLATAS ES CSATORNAZAS TERULETEN),
M. Laszlo.
Hidrologiai Kozlony, Vol 54, No 1, p 10-14, January, 1974. 7 tab.

Descriptors: *Sewerage, *Capital costs, Maintenance costs, *Water supply, Treatment facilities.

Considerations concerning the determination of the optimal life of fixed capital in water supply and sewer systems are presented. Records on the maintenance, repair, and overhaul of water supply and sewer systems should give information on both the costs and on the expectable life of the facility. Such records should also permit the determination of the optimum time for replacement of a given facility. The life of such facilities is determined by physical wear and economic considerations. A given facility should be replaced as soon as the costs of repair and overhaul for a given period of time in the future exceed the total of the earlier repair and overhaul expenditures. Or, replacement may be desired at a time when the anticipated costs of overhaul are nearly equal to the value of a new, modern facility. The quantification of these factors is possible by the introduction of a so-called factor of usefulness, i.e., a sum of scores determined by various criteria, e.g., weight, specific weight, power and fuel consumption, reliability and write-off. (Takacs-FIRL)
W75-01630

8B. Hydraulics

DRAINAGE SYSTEM,
D. A. Alsberg, and G. R. Alsberg.
U S Patent No 3,837,168, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 926, No 4, p 1181, September 24, 1974.

Descriptors: *Patents, *Drainage systems, Runoff, *Flooding, *Seepage, Filtration, Recharge.
Identifiers: Dry wells, Storage basins, Connectors.

A drainage system is described which includes water permeable connectors, and structures or soil penetrations such as dry wells which connect with porous substrata that communicate with the local aquifers or which connect directly to underground streams and which discharge the runoff water into these underground water supplies. Depending upon the seepage rates of the connectors, surface runoff water from the area to be drained is channeled directly to the connectors or to temporary storage basins which in turn direct the water to the connectors at lower rates commensurate with the seepage rates of the connectors. The connectors can be filled with coarse aggregate and can contain filtering layers such as layers of sand interspersed with the coarse aggregate where additional filtering is deemed desirable. (Sinha-OEIS)
W75-01188

LITTORAL FLOW TRAP OR BASIN,
Butterworth (Helen Libbey), Smithfield, Va. (assignee)
A. B. Butterworth, and R. A. McCoy.
U S Patent No 3,835,651, 4 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 926, No 3, p 788, September 17, 1974.

Descriptors: *Patents, *Shore protection, *Beach erosion, *Bulkheads, Erosion, Deposition(Sediments), Structures, Sedimentation.

The littoral flow trap or basin is designed to build up beaches and prevent beach erosion. It comprises an elongated inshore bulkhead extending parallel to the shoreline and an offshore bulkhead. The bulkheads consist of vertical plate sections secured end-to-end to pilings supported in the ground. At least one transverse bulkhead connects the others on the downstream end defining a basin enclosure. Sediment is slowed and trapped to build up the beach. (Sinha-OEIS)
W75-01198

PENETRATION AND MIXING OF HEATED JETS INJECTED INTO WATERWAYS WITH APPLICATION TO THE THERMAL POLLUTION PROBLEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
For primary bibliographic entry see Field 5B.
W75-01203

PARTIALLY PENETRATING MULTIPLE-WELL SYSTEM IN A CONFINED AQUIFER WITH APPLICATION TO A RELIEF WELL DESIGN,
Indian Inst. of Tech. Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W75-01295

SIMPLE NONLINEAR MODEL FOR FLOOD ESTIMATION,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-01298

FLOW AND BED TOPOGRAPHY IN CHANNEL BENDS,
Technical Unov. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
F. Engelund.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY11, Proceedings Paper 10963, p 1631-1648, November 1974. 9 fig, 7 ref, 2 append.

Descriptors: *Channel morphology, *Meanders, *Streambeds, *River beds, *Open channel flow, Hydraulics, Streamflow, Sedimentation, Velocity, Vortices, Rivers, Channels, Flow, Topography, Beds.
Identifiers: *Bed configuration.

Uniform flow in river bends of rectangular or arbitrary cross section was calculated by the slip velocity method and the results were compared with experiments. It was concluded that the helical motion introduced by the channel curvature may be fairly well described. The results were than applied to the more complex problem of flow in a river bend with movable bed. Next, the problem of flow in a meandering channel with fixed side walls was investigated, using a special system of curvilinear coordinates. The solution of the linearlized flow equations yielded a method for calculation of the distribution of the bed shear stress. In the first approximation the large-scale bottom geometry was calculated by considering the lateral sediment balance. The helical flow will move the sediment particles towards the curvature center, while the transverse slope of the bed will give a movement in the opposite direction. (Jess-ISWS)
W75-01308

DESIGN OF A COMBINED SEWER OVERFLOW REGULATOR CONCENTRATOR,
National Environmental Research Center, Edison, N.J. Edison Water Quality Research Div.
For primary bibliographic entry see Field 5D.
W75-01631

8C. Hydraulic Machinery

DESIGN AND CONSTRUCTION OF A RESEARCH STATION FOR THE STUDY OF INDUCED VERTICAL MIXING IN A THERMALLY STRATIFIED POND USING WARM WATER DISCHARGE,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-01409

COMPACT WASTE WATER PUMPING SYSTEMS WITH HIGH CAPACITY (KOMPAKTE ABWASSERPUMPWERKE GROSSER LEISTUNG),
Haeny und Cie, Meilen (Switzerland).
For primary bibliographic entry see Field 5D.
W75-01628

SEWAGE AND EFFLUENT TREATING SYSTEM,
For primary bibliographic entry see Field 5D.
W75-01632

CLARIFYING TANK FOR EFFLUENTS.
For primary bibliographic entry see Field 5D.

W75-01634

CLEAR-SPAN DOMES COVER WATER TANKS.
For primary bibliographic entry see Field 5G.
W75-01639

8D. Soil Mechanics

THE STABILITY OF EARTH AND ROCKFILL DAMS - ANALYSIS BY A MODIFIED METHOD OF SLICES,
Perth Public Works Dept. (Australia).
B. F. Hussey.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No 1, p 56-57, 1974.

Descriptors: *Analytical techniques, *Structural stability, *Earth dams, *Rockfill dams, *Stress analysis, Computer programs, Structural design, Safety factors, Dam design.
Identifiers: *Method of slices.

A method is described which is applicable to any earth or rockfill dam and applies the vertical slice technique in such a way that the equilibrium of each slice in succession can be analysed by methods applicable to statically determinate problems. To make this possible, a concept of factor of safety, different from that normally used, is adopted, and in addition, inclinations are assumed for a single resultant of all the forces acting on each interslice face. Unless the inclinations assumed for these interslice force resultants are well chosen, the lines of action determined for some of them will be in quite impossible positions, even outside the dam. Any reasonable assumption for the inclinations of the several interslice forces, which lead to reasonable locations of all resultants and all slices being in static equilibrium give virtually the same computed factor of safety. The method has been programmed for solution by computer. (CSIRO)
W75-01255

8F. Concrete

ARTIFICIAL LIGHT-WEIGHT AGGREGATE FROM WASTE MUD OF SILICA SAND FACTORIES AND WASTE FLUID OF PULP FACTORY,
Nagoya Inst. of Tech. (Japan). Materials Research Lab.
K-I. Hukuo, Y. Hikichi, and H. Takada.
In: Proceedings of the 16th Japanese Congress on Materials Research, Non-metallic materials, 1972, p 256-258 (1972). 4 fig, 3 tab.

Descriptors: *Pulp wastes, Industrial wastes, *Silica, *Sands, Concretes, *Aggregates, *Concrete additives, Sludge, *Waste disposal, *Byproducts, Solid wastes.
Identifiers: Spent pulping liquors.

A lightweight material suitable for use as the aggregate fraction of concrete was prepared by mixing waste mud from the processing of silicon dioxide sand with 20% of spent soda pulping liquor, followed by extrusion, drying, pelletizing, calcining at 200-900C in an oxidizing atmosphere, and firing at 1100-1300C. (Witt-IPC)
W75-01372

SOIL-CEMENT FOR WATER CONTROL STRUCTURES,
Portland Cement Association, Skokie, Ill. Water Resources Dept.
C. R. Wilder.
In: Water for the Human Environment, Volume I, Congress Papers; Proceedings of the First World Congress on Water Resources (4 Vol), Chicago, Illinois, September 24-28, 1973. International Water Resources Association, Champaign, Illinois, p 433-442. 4 fig, 11 ref.

Descriptors: *Water resources development, *Hydraulic structures, *Linings, *Soil cement, Research and development, Earth dams, Protective coatings, Reservoirs, Soil stabilization.

Since 1961, soil-cement has been used in more than 70 water control structures as slope protection for earth dams and embankments and impervious lining for reservoirs and lagoons. Laboratory and field research demonstrated its technical suitability, and competitive bids its economic advantages. Adequate material testing, design, and construction procedures were developed. Performance in service to data has ranged from 'satisfactory' to 'exceptional', reflecting the conservative design criteria used and good construction practices that were developed. Further developments, such as the all-soil-cement dam, are now being seriously considered. (See also W75-01428) (Humphreys-ISWS)
W75-01470

8G. Materials

EFFECTS OF PIPE MATERIALS ON QUALITY OF WATER SAMPLES,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W75-01627

EXAMPLES OF THE EFFECTIVE USE OF PLASTIC MATERIALS IN A MUNICIPAL WATER SUPPLY AND WASTE WATER TREATMENT PLANT (BEISPIELE DER EFFEKTIVEN PLASTANWENDUNG IN EINEM VEB WASSERVERSORGUND UND ABWASSERBEHANDLUNG),
VEB Wasserversorgund und Abwasserbehandlung, Magdeburg (East Germany).
For primary bibliographic entry see Field 5D.
W75-01638

8I. Fisheries Engineering

AQUARIUM SYSTEMS FOR THE MAINTENANCE OF CTENOPHORES AND JELLYFISH AND FOR THE HATCHING AND HARVESTING OF BRINE SHRIMP (ARTEMIA SALINA) LARVAE,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst., and Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
W. W. Ward.
Chesapeake Science, Vol 15, No 2, p 116-118, June 1974. 2 fig, 9 ref.

Descriptors: *Jelly fish, *Brine shrimp, *Aquaria, Equipment, Invertebrates, Fish management, Fish handling facilities, Larvae, Technology, Fish harvest, Methodology, Equipment.
Identifiers: *Ctenophores, Fish maintenance, Hatching tanks.

Ctenophores and jellyfish are the most difficult marine invertebrates to maintain in artificial aquaria. They require circulating water to distribute a constant supply of live food and to disperse mucus and slime which these animals produce in abundance. They are easily trapped in filter intakes and overflow tubes, and they can be damaged or destroyed in the turbulance produced by air stones. Two practical and inexpensive aquarium systems designed specifically to overcome these problems are described-one for the hatching and semi-automatic harvesting of large quantities of brine shrimp larvae, and a second for the long-term maintenance of ctenophores and jellyfish. (Katz)
W75-01419

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

DESERT RESEARCH INSTITUTE, ANNUAL REPORT, 1970-1971.
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 9D.
W75-01202

NINTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1972-JUNE 30, 1973.
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W75-01209

A CURRICULUM ACTIVITIES GUIDE TO WATER POLLUTION AND ENVIRONMENTAL STUDIES: ACTIVITIES, VOLUME 1.
Environmental Protection Agency, Washington, D.C. Training Grants Branch.
For primary bibliographic entry see Field 6B.
W75-01314

9D. Grants, Contracts, and Research Act Allotments

DESERT RESEARCH INSTITUTE, ANNUAL REPORT, 1970-1971.
Nevada Univ., Reno. Desert Research Inst.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 338, $3.75 paper copy, $2.25 in microfiche. 1972. 36 p, 35 fig. OWRT A-999-NEV(3).

Descriptors: *Water Resources Research Act, *Nevada, *Universities, *Grants, *Water Resources Institute, Planning, Research and development, Water resources, Projects, Water supply, Hydrogeology, Water quality.

The annual report of the Desert Research Institute presented highlights of selected investigations underway during fiscal year 1971. The Center for Water Resources Research is one of five research groups at the Desert Research Institute. Nevada's water problems are chiefly in the areas of development and management of the state's limited water resources. These and closely related problem areas received emphasis in the program of the Center for Water Resources Research. (Humphreys-ISWS)
W75-01202

NINTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1972-JUNE 30, 1973.
Maryland Univ., College Park. Water Resources Research Center.
Available from National Technical Information Service, Springfield, Va. 22161, as PB-237 514, $5.25 in paper copy, $2.25 in microfiche. 1973. 110 p. OWRT A-999-MD(9).

Descriptors: *Water Resources Research Act, *Maryland, *Colleges, *Water Resources Institute, *Universities, *Training, Grants, Projects, Water quality, Wetlands, Water pollution.

The Ninth Annual Report of Maryland's Water Resources Research Center at the University of Maryland described research and other activities underway during Fiscal Year 1973 (July 1, 1972 through June 30, 1973), and identified current and anticipated water problems. Maryland's major water concern is water quality for the maintenance of high quality water for recreation, fishing, and shellfish production. The state is also concerned with municipal water use despite the deleterious

effects from transportational use, and the complications of runoff from agricultural, suburban, urban, and industrial use, including cooling water. These and closely related problem areas received emphasis in the program of the Water Resources Research Center. (Humphreys-ISWS)
W75-01209

EXPRO '75, A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1975.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
July 1974, 209 p, 3 append.

Descriptors: *Federal government, *Administrative agencies, *Grants, *Contracts, Environment, Research and development, Projects, Programs.
Identifiers: Environmental Protection Agency.

Part I presents the general guidelines for developing grant or contract projects and for submission of grant applications or contract proposals. Part II lists grant and contract tasks planned for funding. Program areas and numbers of program elements are: health effects, 15; ecological processes and effects, 26; municipal pollution control, 6; industrial pollution control, 3; nonpoint pollution control, 5; air pollution control, 5; data and information research, 2; equipment and techniques, 7; quality assurance, 1; socio-economic research, 11; and minority institutions research support, 1. Each program element output, each research achievement plan objective, and each task under an achievement plan is defined. Expected funding mechanisms for the 491 tasks described are either contract, research grant, or demonstration grant. (Humphreys-ISWS)
W75-01313

WATER RESOURCES, (ANNUAL REPORT, FISCAL YEAR 1973),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
B. M. Little.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-237 534, $3.75 in paper copy, $2.25 in microfiche. Bulletin 65, 1973. 48 p. OWRT A-999-VA(17).

Descriptors: *Water Resources Institute, *Virginia, *Universities, *Water resources research act, Colleges, Water resources development, Administration, Forecasting, Water quality, Waste treatment.

The annual report for Fiscal Year 1973 of Virginia's Water Resources Research Center at Virginia Polytechnic Institute and State University is a summary of the year's research programs which characterized concern for preserving natural water resources. Areas of research included programs related to forecasting for management decisions, monitoring water quality, preserving water quality, waste treatment, and administrative aspects of management responsibilities for water resources. (Humphreys-ISWS)
W75-01316

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

WAMIS--AN AID IN LOCATING INFORMATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
L. M. White.
Progressive Agriculture in Arizona, Vol 26, No 2, p 10-11, March-April, 1974. 2 fig. OWRT A-042-ARIZ(2). 14-31-0001-4003.

Descriptors: *Information retrieval, *Bibliographies, *Water yield improvement, *Vegetation effects, *Land management, Watershed management, Forest management, Clear-cutting, Water yield, Water sources, Southwest US, *Arizona.
Identifiers: *Vegetation conversion.

The Watershed Management Information System (WAMIS) is a computerized reference retrieval system designed to provide users with bibliographic references to sources of information in an area of interest. Citations cover the topic of vegetation management and treatments, such as timber harvesting or vegetation conversion, and their effects on water and other resource-based products of the treated area. WAMIS is concerned primarily with reports of studies done in Arizona and the Southwest, and is being developed at the Department of Watershed Management, University of Arizona, in cooperation with the Arid Lands Information System on the same campus. After references to documents are banked into WAMIS, they are retrieved in response to a user's request; the user receives a computer printout of citations and abstracts on the topic of interest. A possible outline for user requests is given.
W75-01219

10B. Reference and Retrieval

AN INVENTORY OF PUBLISHED AND STORED CHEMICAL ANALYSES OF SURFACE WATER IN CALIFORNIA, 1906-71,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05A.
W75-01178

10F. Preparation Of Reviews

SUBSIDENCE IN UNITED STATES DUE TO GROUND-WATER OVERDRAFT--A REVIEW,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 02F.
W75-01159

AN ASSESSMENT OF REMOTE SENSING APPLICATIONS IN HYDROLOGIC ENGINEERING,
Hydrologic Engineering Center, Davis, Calif.
For primary bibliographic entry see Field 07B.
W75-01312

EFFECTS OF TEMPERATURE ON THE TOXICITY OF OIL REFINERY WASTE, SODIUM CHLORATE, AND TREATED SEWAGE TO FATHEAD MINNOWS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05C.
W75-01333

SUBJECT INDEX

2-4-D
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

ABLATION
Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

ABSORPTION
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

ACETIC ACID
The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

ACETYLCHOLINESTERASE
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

ACID MINE WATER
Coal Mining and its Effect on Water Quality,
W75-01435 5B

ACIDIFICATION
Effects of Acidification of Swedish Lakes,
W75-01473 5C

ACTIVATED CARBON
Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

ACTIVATED SLUDGE
Sewage Treatment Apparatus,
W75-01187 5D

Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

ADMINISTRATION
Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

Water Management Problems,
W75-01434 6E

Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

ADMINISTRATIVE AGENCIES
EXPRO '75, A Listing of Extramural Projects to be Funded in Fiscal Year 1975.
W75-01313 9D

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

ADMINISTRATIVE DECISIONS
Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

ADSORPTION
Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

AERATED LAGOONS
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

AERATION
Sewage Treatment Apparatus,
W75-01187 5D

Treatment for Waste Water or the Like,
W75-01194 5D

AERIAL PHOTOGRAPHY
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

AEROBACTER AEROGENOSE 243 TYPE 2 PHAGE
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

AESTHETIC RIVER INDEX
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

AESTHETICS
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

AFRICA
East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

AFRICA (LAKE CHAD BASIN)
Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

AGAR METHOD
The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

AGGREGATES
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

AGRICULTURAL WATERSHEDS
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

AIR POLLUTION
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

AIR-WATER INTERFACES
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

ALABAMA
Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

Progress Report on Flood-Frequency Synthesis for Small Streams in Alabama,
W75-01350 2E

ALASKA
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

ALBEDO
Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

ALBUQUERQUE-BELEN BASIN (NM)
Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

ALGAE
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

ALGAE

A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

Amino Acid Composition of Freshwater Algae,
W75-01238 5C

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

ALGAL BIOMASS

The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

ALGAL CANCER

Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

ALGORITHMS

Pipeline Network Calculations Using Sparse Computation Techniques,
W75-01626 8A

ALLIGATORWEED

Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

ALLUVIUM

Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

ALUMINUM

The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

Clear-Span Domes Cover Water Tanks.
W75-01639 5G

AMCHITKA ISLAND (ALASKA)

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

AMINO ACIDS

Amino Acid Composition of Freshwater Algae,
W75-01238 5C

AMMONIA NITROGEN

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

AMMONIFICATION

Experimental Study of Ammonification in Aquatic Environments (In French),
W75-01132 5B

Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

AMMONIFYING BACTERIA

Experimental Study of Ammonification in Aquatic Environments (In French),
W75-01132 5B

AMPHOTERICIN B

Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

ANAEROBIC BACTERIA

Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

ANALOG MODELS

Analog Subroutines for the Finite Element Method,
W75-01320 4B

ANALYTICAL TECHNIQUES

Groundwater Management and Salinity Control,
W75-01117 4B

Determination of the Radon Content in Water by a Widely Used Instrument, (In Russian),
W75-01153 5A

Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

Methods for Analysis of Irrigated Soils.
W75-01239 2G

On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

Determination of Chromium in Water and Waste Water (Bestimmung des Chroms in Wasser und Abwasser),
W75-01641 5A

ANCLOTE RIVER (FLA)

The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

ANGOLA

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

ANTARCTIC

Chemical Composition of an Antarctic Snow Profile,
W75-01597 2C

ANTIBIOTIC ACTIVITY (PLANTS)

Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

ANTIBIOTICS (PESTICIDES)

Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

ANTIMONY

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

APPLE TREES

Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

AQUA-SANS

Aqua-Sans Sewage Treatment System,
W75-01471 5D

AQUARIA
Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

AQUATIC DRIFT
Drifting Behavior of Ephemerella Ignita (Ephemeroptera), (In German),
W75-01636 2I

AQUATIC HABITATS
Annual Report July 1971 Through December 1972,
W75-01348 6B

AQUATIC INSECTS
The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

Drifting Behavior of Ephemerella Ignita (Ephemeroptera), (In German),
W75-01636 2I

AQUATIC MICROORGANISMS
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

AQUATIC PLANTS
Isolates of Penicillium, Aspergillus, and Trichoderma Toxic to Aquatic Plants,
W75-01225 5C

Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

AQUATIC WEED CONTROL
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

Mechanical and Habitat Manipulation for Aquatic Plant Management,
W75-01481 5C

AQUATIC WEEDS
Seaweed Invasion,
W75-01492 5C

AQUEOUS SOLUTIONS
Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

AQUIFER MANAGEMENT
Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

AQUIFER TESTING
Water and Waste Flow Measurement,
W75-01262 7B

AQUIFERS
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

ARAUCANIAN LAKES (CHILE)
Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

ARCHAEOLOGY
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

ARCTIC
Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

ARDMORE (OKLA)
Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

ARGENTINA (CONLARA VALLEY)
Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

ARIZONA
WAMIS--An Aid in Locating Information,
W75-01219 10A

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

ARKANSAS
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

ARKANSAS RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

ARKANSAS RIVER (ARK)

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

AROCLOR 1254
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

AROCLORS
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

AROMATIC COMPOUNDS
Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

ARSENIC COMPOUNDS
Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

ARTESIA (NM)
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

ARTIFICIAL PRECIPITATION
Extension of Israel's National Water System as a Function of Artificial Rainfall Prospects,
W75-01297 2A

ASTERS
Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

ATLANTIC SALMON
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

ATTITUDES
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

AUSTRALIA
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

Urban Water Use in Australia,
W75-01254 6D

Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

Australian Representative Basins Programme--Progress 1973.
W75-01310 7C

Stream Gauging Information, Australia--Supplement 1972.
W75-01311 7C

AUTOMATIC CONTROL
Control of Combined Sewer Overflow Events,
W75-01138 5G

AUTOMATION
Control of Combined Sewer Overflow Events,
W75-01138 5G

Automated Fluid Injector,
W75-01625 7B

AVALANCHE FORECASTING
A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

AVALANCHES
A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

BACKFLUSHING
Strainer Device for Liquids,
W75-01637 5D

BACTERIA
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

Production of Bacterial Biomass in the Water of the Ilawa Lakes,
W75-01488 5C

BACTERIOPHAGE
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

BAD LAKE RESEARCH WATERSHED (SASK-CAN)
Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

BALANCE OF NATURE
Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

BARK
Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

BARLEY
Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

BASE FLOW
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

BASELINE STUDIES
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

Flax Pond: An Estuarine Marsh,
W75-01513 5C

BASIC DATA COLLECTIONS
Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

BASIDIOCARP
Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

BASINS
Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

BAY RIVER (NC)
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

BAYS
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

BEACH EROSION
Littoral Flow Trap or Basin,
W75-01198 8B

BEACHES
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

BEAN
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

BEAR RIVER BASIN (UTAH)
Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

BED CONFIGURATION
Flow and Bed Topography in Channel Bends,
W75-01308 8B

BENEFITS
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

BENTHIC COMMUNITIES
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

BENTHIC FAUNA
On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

BENTHOS
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

BENZENE HEXACHLORIDE
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

BERMUDA
Bermuda Tunnels for Fresh Water,
W75-01464 4B

BIBLIOGRAPHIES
WAMIS--An Aid in Locating Information,
W75-01219 10A

BILGE WATER
Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

BIOACCUMULATION
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

BIOASSAY
Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and its Prevention,
W75-01604 5C

BIOCHEMICAL OXYGEN DEMAND
Zones of Nitrification,
W75-01103 5B

A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

Waste from Wastepaper Utilization,
W75-01261 5B

Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II. Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

Generalization, Typification, and Kinetic Analysis of the Biochemical Oxygen Demand Curves Based on BOD-Experiments (Obobshcheniye, titizatsiya i kineticheskiy analiz krivykh potrebleniya kisloroda po dannym BPK-opytov),
W75-01647 5A

BIOCHEMISTRY
Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

BIOCONTROL
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

BIODEGRADATION
Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

BIOGEOCHEMICAL CYCLES
Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

BIOINDICATORS
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

BIOINDICATORS

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

BIOLOGICAL COMMUNITIES
The Effect of an Influx of New Species on the Diversity of Protozoan Communities,
W75-01486 5C

BIOLOGICAL TREATMENT
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

Waste from Wastepaper Utilization,
W75-01261 5B

Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

BIOMASS
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

BIOMES (HIGH MOUNTAIN)
Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

BIOMPHALARIA-GLABRATA
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

BIOTA
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

BLACK CREEK (SOUTH CAROLINA)
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

BLACK SEA
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

BLEACHING WASTES
Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

BLIGHT
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

Epidemiological Patterns of Phytophthora Infestans Under Semi-Arid Conditions,
W75-01610 3F

BLOODY RUN DRAINAGE BASIN (CINCINNATI-OHIO)
Screening Model for Storm Water Control,
W75-01110 5D

BLUE GLACIER (WASHINGTON)
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

BOND ISSUES
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

BORDER IRRIGATION
Data for Border Irrigation Models,
W75-01120 3F

BOSTON HARBOR (MASS)
Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

BOTTOM SEDIMENTS
Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

BOUSSINESQ'S EQUATION
Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

BRIDGES
I-90 Lake Washington Circulation Study.
W75-01134 5G

BRINE SHRIMP
Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

BROOK TROUT
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

BULK DENSITY
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

BULKHEADS
Littoral Flow Trap or Basin,
W75-01198 8B

BYPRODUCTS
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

CACHE RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

CADMIUM
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

CALANIPEDA AQUAE-DULCIS
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

CALCAREOUS SOILS
Use of Phosphoric and Sulfuric Acids to Reduce Soil Crusting and Improve Emergence of Sugarbeet (Beta Vulgaris L.) Seedlings,
W75-01386 3F

CALCIUM
Influence of Restricted Water Supply on Blossom-End Rot and Ionic Composition of Tomatoes Grown in Nutrient Solution,
W75-01612 3F

CALCIUM CHLORIDE
The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

CALIBRATIONS
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

CALIFORNIA
A Process for Federal Water Planning at the Field Level,
W75-01115 6A

Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

Long-Range Goal and Information Needs of the Coordinated Snow Survey Program in California,
W75-01527 7C

A New California Department of Water Resources Telemetry System,
W75-01552 7B

CALIFORNIA (DELTA-MENDOTA CANAL)
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

CALORIC CONTENT
A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

CANADA
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

Remote Sensing Applications in Canadian Ice Reconnaissance,
W75-01570 7B

An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

CANALS
PE Pipe Used at Oxford Paper.
W75-01371 5D

A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

CANBERRA (A.C.T.)
Advanced Waste Water Treatment,
W75-01248 5D

CANKER DEVELOPMENT
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

CANYONLANDS NATIONAL PARK
The Geologic Story of Canyonlands National Park,
W75-01163 6B

CANYONS
The Geologic Story of Canyonlands National Park,
W75-01163 6B

CAPILLARY ACTION
Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

CAPILLARY CONDUCTIVITY
Derivation of an Equation of Infiltration,
W75-01126 2G

CAPITAL COSTS
Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Investigation of the Optimal Life of Fixed Capital in Water Supply and Sewer Systems (Az Alloeszkozok Optimalis Elettartamanak Vizsgalata a Vizellatas es Csatornazas Teruleten),
W75-01630 8A

CARBOHYDRATES
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

CARBON
The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

CARBON-14
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

CARBON BUDGET
The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

CARBON DIOXIDE
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

CARBON ROD TECHNIQUE
Possibilities of the 'Carbon Rod' Technique for the Determination of Trace Elements in Water by Atomic Absorption,
W75-01619 5A

CARCINOGENS
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

CARDIOVASCULAR DISEASES
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

CARMEL VALLEY (CALIF)
A Process for Federal Water Planning at the Field Level,
W75-01115 6A

CASPIAN SEA
Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

CATALYSTS
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

CATALYTIC OXIDATION
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

CAVE-INS
Drain Construction Under High Groundwater Level Conditions (O Stroitel 'Stve Drenazha v Usloviyakh Vysokogo Uronnya Gruntovykh Vod),
W75-01629 8A

CELL DIFFUSION METHOD
The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

CENTRAL AMERICA
World Meteorological Organization Activities in Central America,
W75-01449 6E

CEYLON
Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

CHANNEL MORPHOLOGY
Flow and Bed Topography in Channel Bends,
W75-01308 8B

CHELATION
The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

CHEMICAL ANALYSIS
Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

CHEMICAL COMPOSITION
Chemical Composition of an Antarctic Snow Profile,
W75-01597 2C

CHEMICAL OXYGEN DEMAND
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

CHEMICAL PRECIPITATION
Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

CHEMICAL STUDIES
Some Chemical Aspects of the Humus of Underwater Sediments, (In Spanish),
W75-01603 2J

CHEMICAL WASTES
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

CHEMISTRY
Chemistry,
W75-01230 5A

CHEMISTRY OF PRECIPITATION
The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

CHENA RIVER (ALASKA)
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

CHICAGO (ILL)
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

CHILE
Geology of Salars in Northern Chile,
W75-01351 2H

CHIRONOMID LARVAE
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

CHITOSAN
The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

CHLORIDES
Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

CHLORINATED HYDROCARBON PESTICIDES
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

CHLORINATED SEWAGE
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

CHLORINATION
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

CHLOROPHYLL
Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

CHOLERA
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

CHROMATOGRAPHY
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

CHROMIUM
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Determination of Chromium in Water and Waste Water (Bestimmung des Chroms in Wasser und Abwasser),
W75-01641 5A

CIRCULATION
Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

CITIES
Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

Urban Water Use in Australia,
W75-01254 6D

CITIZENS GROUPS
Gull Lake: Past, Present, Future.
W75-01327 5B

CITRUS FRUITS
Water Needs of Florida Citrus,
W75-01222 3F

Measure of Water Stress in Citrus,
W75-01223 3F

CITY PLANNING
Storm Drainage System Design and New City Planning,
W75-01253 8A

The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

CLARIFICATION
Clarifying Tank for Effluents.
W75-01634 5D

CLASSIFICATION
Systematization of Flood Control Measures,
W75-01302 4A

CLAY MINERALS
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

CLEMSON RESEARCH WATERSHED (SO CAR)
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

CLIMATE
Vegetation of the Earth in Relation to Climate and Eco-Physiological Conditions,
W75-01116 2I

CLIMATES
East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

CLIMATOLOGY
The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

Snowpack and Related Trends in Mountains of the Southwestern United States,
W75-01524 2C

CLOSED CONDUIT FLOW
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

CLOSED CONDUITS
Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

CLOUD SEEDING
Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

COAL MINES
Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

COAL TAR CHEMICALS
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

COASTAL MARSHES
Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

COASTAL PLAINS
Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

COASTAL WATERS
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

COASTS
Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

Annual Report July 1971 Through December 1972,
W75-01348 6B

Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

COLLEGES
Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

COLOR
Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Ozonation of a Kraft Mill Effluent,
W75-01279 5D

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

COLORADO
Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

COLORADO RIVER
The Geologic Story of Canyonlands National Park,
W75-01163 6B

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

COLORADO RIVER BASIN
River Mileage Tabulations for the Colorado River Basin. Communities and Major Tributaries.
W75-01309 7C

COLORADO RIVER (CALIF)
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

COLORIMETRY
Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

COMBINED SEWER OVERFLOWS
Control of Combined Sewer Overflow Events,
W75-01138 5G

COMBINED SEWERS
Screening Model for Storm Water Control,
W75-01110 5D

Control of Combined Sewer Overflow Events,
W75-01138 5G

Design of a Combined Sewer Overflow Regulator Concentrator,
W75-01631 5D

COMMERCIAL FISH
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

COMMERCIAL FISHING
Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

COMPETITION
A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

COMPREHENSIVE PLANNING
The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

Indian National Water Plan and Grid,
W75-01458 6B

COMPUTER MEMORY REQUIREMENTS
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

COMPUTER MODELS
Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

COMPUTER PROGRAMS
Mass Balance and Economic Models,
W75-01388 6A

The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

COMPUTER TIME REQUIREMENTS
Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

CONCRETE ADDITIVES
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

CONCRETE-LINED CANALS
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

CONDENSATION
Water Still,
W75-01185 5F

CONDUITS
PE Pipe Used at Oxford Paper.
W75-01371 5D

CONFERENCES
Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Northwestern Minnesota.
W75-01390 6B

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

The International Association on Water Pollution Research,
W75-01446 5G

CONJUNCTIVE USE
Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

CONJUNCTIVE USE MANAGEMENT
Groundwater Management and Salinity Control,
W75-01117 4B

CONNATE WATER
Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

CONNECTICUT
Hydrogeology of Southeastern Connecticut,
W75-01165 7C

The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

CONNECTICUT (LINSLEY POND)
Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

CONSERVATION
Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

CONSTRUCTION
Pipeline Network Calculations Using Sparse Computation Techniques,
W75-01626 8A

CONSTRUCTION MATERIALS
Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

CONSULTANT SELECTION
Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

CONTRACTS
EXPRO '75, A Listing of Extramural Projects to be Funded in Fiscal Year 1975.
W75-01313 9D

CONTROL
A National Policy for Phosphate Control in the Environment,
W75-01495 5C

CONVECTION
The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

CONVEYANCE STRUCTURES
PE Pipe Used at Oxford Paper.
W75-01371 5D

COOLING PONDS
Surface Heat Loss From Cooling Ponds,
W75-01296 1A

COOLING SYSTEMS
Compact Waste Water Pumping Systems with High Capacity (Kompakte Abwasserpumpwerke Grosser Leistung),
W75-01628 5D

COOLING TOWERS
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

COOLING WATER
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

COOPERATIVES
Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

COPEPODS
Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

COPPER
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

CORN (FIELD)
Phosphorus Compounds in Corn Tissues Under Unfavorable Conditions of Moistening, (In Russian),
W75-01151 3F

CORN LEAF BLIGHT
Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

COST-BENEFIT ANALYSIS
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

COST COMPARISONS
Advanced Waste Water Treatment (Part II),
W75-01249 5D

COST FUNCTIONS
Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

COSTS
Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

CRASSULACEAN-ACID
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

CRISTULARIELLA-PYRAMIDALIS
Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

CROP RESPONSE
Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

CRYOLOGY
Dielectric Constants in the Management of Freezing Systems,
W75-01594 2C

CRYSTAL GROWTH
Cloud Droplet Accretion on Snow Crystals,
W75-01540 2B

CTENOPHORES
Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

CULVERTS
Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

CUNENE RIVER
International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

CURRICULUM ACTIVITIES GUIDE
A Curriculum Activities Guide to Water Pollution and Environmental Studies: Activities, Volume 1.
W75-01314 6B

CYANIDE ION
Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

CYANOPHYTA
Blue-Green Algal Genetics: A New Methodology,
W75-01514 5C

CYCLING NUTRIENTS
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

DAMS
The Consequences of Building Dams on the Environment,
W75-01431 6G

DAPHNIANS
Effects of Acidification of Swedish Lakes,
W75-01473 5C

DATA COLLECTIONS
Data for Border Irrigation Models,
W75-01120 3F

Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

River Mileage Tabulations for the Colorado River Basin. Communities and Major Tributaries.
W75-01309 7C

Stream Gauging Information, Australia--Supplement 1972.
W75-01311 7C

The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration,
W75-01349 6E

Advanced Concepts and Techniques in the Study of Snow and Ice Resources.
W75-01522 2C

New Concepts in Snow Surveying to Meet Expanding Needs,
W75-01526 7B

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

Ice Information Collection, Dissemination and Uses on the Great Lakes,
W75-01556 7C

DATA PROCESSING
A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

DATA STORAGE AND RETRIEVAL
An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

DATA TRANSMISSION
Meteor Burst Communication,
W75-01593 7B

DDE
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

DDT
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

DECIDUOUS TREES
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

DECISION MAKING
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

Integrated Approach to Water Resources Development in Water Scarce Countries,
W75-01454 6B

Planning for Water Resource Management,
W75-01456 6B

DECISION RULES
Groundwater Management and Salinity Control,
W75-01117 4B

DECOMPOSING ORGANIC MATTER
Experimental Study of Ammonification in Aquatic Environments (In French),
W75-01132 5B

DEFORMATION
Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

DEHYDROGENASE ACTIVITY
Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II. Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

DELAWARE ESTUARY
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

DELAWARE RIVER
The Delaware Valley Plan.
W75-01137 6D

Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

DELAWARE RIVER BASIN
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

DEMONSTRATION WATERSHEDS
A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

DENITRIFICATION
Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

DENITRIFYING BACTERIA
Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

DENMARK
Freshwater Ecology,
W75-01475 5C

DENMARK (LAKE ALMINDSO)
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

DENSITY
Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

DENVER (COLO)
Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

DERWENT RIVER (AUST)
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

DESALINATION
Freeze Crystallization of Saline Water with a Direct Contact Refrigerant,
W75-01197 3A

DESERTS
Geology of Salars in Northern Chile,
W75-01351 2H

DESIGN
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

DESIGN CRITERIA
Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

Advanced Waste Water Treatment,
W75-01248 5D

Design of a Combined Sewer Overflow Regulator Concentrator,
W75-01631 5D

DESIGN FLOOD
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

DESOXYRIBONUCLEIC ACID
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

DESULFOVIBRIO
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

DETERGENTS
A National Policy for Phosphate Control in the Environment,
W75-01495 5C

DEUTERIUM
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

DEVELOPING COUNTRIES
Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

DEWATERING
Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

DIAL CREEK WATERSHED (NC)
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

DIATOMS
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

Effects of Acidification of Swedish Lakes,
W75-01473 5C

DIEL VARIATION
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

DIELDRIN
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

DIELECTRIC CONSTANTS
Dielectric Constants in the Management of Freezing Systems,
W75-01594 2C

Electrical Parameters of Some Frost-Prone Soils,
W75-01595 2C

DIFFUSION
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

DIFFUSION COEFFICIENT
The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

DIFFUSIVITY
Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

DIPTERA
The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

DISASTERS
Flood Insurance and Disaster Assistance.
W75-01341 6F

DISCHARGE (WATER)
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

DISPERSION
Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

DISSOLVED OXYGEN
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

DISTILLATION
Water Still,
W75-01185 5F

DISTRIBUTION
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

DISTRIBUTION PATTERNS
East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

DITCHES
Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

DIVISION SYNCHRONY
Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

DOMESTIC WASTES
Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

DOMESTIC WATERS
Gull Lake: Past, Present, Future.
W75-01327 5B

DOMINANT ORGANISMS
Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

DRAINAGE
Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

DRAINAGE AREA
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

DRAINAGE SYSTEMS
Drainage System,
W75-01188 8B

Storm Drainage System Design and New City Planning,
W75-01253 8A

DRAINAGE WATER
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

DRAWDOWN
Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

DROUGHT RESISTANCE
Role of Physiological Plant Activity in Adaptive Increase in Drought Resistance: 1. Effect of Heat Regimes on Moistened Germinating Wheat Seeds, (In Russian),
W75-01150 3F

Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

DUSTS
Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

DYNAMIC MODELING
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

DYNAMIC PROGRAMMING
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

EARTH DAMS
The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

ECOLOGY
Freshwater Ecology,
W75-01475 5C

ECONOMIC EFFICIENCY
Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

ECONOMIC IMPACT
A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

ECONOMIC MODELS
Mass Balance and Economic Models,
W75-01388 6A

A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

ECONOMICS
Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

ECOSYSTEM
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

ECOSYSTEMS
Vegetation of the Earth in Relation to Climate and Eco-Physiological Conditions,
W75-01116 2I

The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

EDUCATION
A Curriculum Activities Guide to Water Pollution and Environmental Studies: Activities, Volume 1.
W75-01314 6B

EFFECTIVE COMPLIANCE
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

EFFECTS
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

EFFLUENT CHARGES
Effects of Wastewater Surcharges,
W75-01330 5G

EFFLUENTS
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

Sewage and Effluent Treating System,
W75-01632 5D

Clarifying Tank for Effluents.
W75-01634 5D

ELASTICITY OF DEMAND
Effects of Wastewater Surcharges,
W75-01330 5G

ELECTRIC POWERPLANTS
Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

ELECTRICAL STUDIES
Dielectric Constants in the Management of Freezing Systems,
W75-01594 2C

Electrical Parameters of Some Frost-Prone Soils,
W75-01595 2C

ELECTRODES
Microelectrodes Suitable for Use in Cells with High Hydrostatic Pressure,
W75-01596 7B

ELECTROMAGNETIC WAVES
Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

ELECTRON MICROSCOPY
Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

ELECTRONIC EQUIPMENT
Meteor Burst Communication,
W75-01593 7B

ENERGY
Water and the Energy Crisis,
W75-01430 4A

ENERGY BUDGET
The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

ENERGY DISSIPATION
Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

ENERGY EQUATION
An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

ENERGY TRANSFER
Basic Difficulties in Predicting Evaporation,
W75-01300 2D

An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

ENGLAND
Nitrogen: A Problem of Decreasing Dilution,
W75-01502 5B

ENVIRONMENT
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

A Curriculum Activities Guide to Water Pollution and Environmental Studies: Activities, Volume 1.
W75-01314 6B

Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

Annual Report July 1971 Through December 1972,
W75-01348 6B

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Global Action for Man's Water Resources,
W75-01429 6F

The Consequences of Building Dams on the Environment,
W75-01431 6G

Warming of the World's Waters by Man,
W75-01432 5C

Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

Coal Mining and its Effect on Water Quality,
W75-01435 5B

Some Water Resources Problems and Human Environment,
W75-01436 4A

Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

Aqua-Sans Sewage Treatment System,
W75-01471 5D

Problems Encountered in Multidisciplinary Resources and Environmental Simulation Models Development,
W75-01500 6A

ENVIRONMENTAL CONTROL
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

ENVIRONMENTAL EFFECTS
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

Chemistry,
W75-01230 5A

RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

ENVIRONMENTAL ENGINEERING
Screening Model for Storm Water Control,
W75-01110 5D

Annual Report July 1971 Through December 1972,
W75-01348 6B

ENVIRONMENTAL GRADIENTS
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

ENVIRONMENTAL IMPACT STATEMENTS
Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

ENZYMES
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

EPHEMERELLA-IGNITA
Drifting Behavior of Ephemerella Ignita (Ephemeroptera), (In German),
W75-01636 2I

EPIDEMICS
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

EPIDEMIOLOGICAL STUDIES
Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

EQUATIONS
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

Generalization, Typification, and Kinetic Analysis of the Biochemical Oxygen Demand Curves Based on BOD-Experiments (Obobshcheniye, titizatsiya i kineticheskiy analiz krivykh potrebleniya kisloroda po dannym BPK-opytov),
W75-01647 5A

EQUILIBRIUM
The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

ERTS
Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

ERTS-1
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

ESTUARIES
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

Flax Pond: An Estuarine Marsh,
W75-01513 5C

ETHANOL COMBUSTION
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

EUCALYPT SPECIES
A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

EUTROPHICATION
Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Gull Lake: Past, Present, Future.
W75-01327 5B

Eutrophication: A Mathematical Model,
W75-01385 5C

Report of the Water Management Sector Group on Eutrophication Control.
W75-01476 5C

Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

Phosphorus Model of Lake Eutrophication,
W75-01496 5C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

EVALUATION
A Process for Federal Water Planning at the Field Level,
W75-01115 6A

Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

EVAPORATION
Basic Difficulties in Predicting Evaporation,
W75-01300 2D

Survey of New Zealand Tank Evaporation,
W75-01307 2D

Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

EVAPORIMETERS
Survey of New Zealand Tank Evaporation,
W75-01307 2D

EVAPOTRANSPIRATION
Water Needs of Florida Citrus,
W75-01222 3F

Measure of Water Stress in Citrus,
W75-01223 3F

Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

EXPANSIVITY
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

EXPENDITURES
Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

EXPLORATION
The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration,
W75-01349 6E

EXTERNALITIES
Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

FARM PONDS
Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

FARM WASTES
The Occurrence of Nitrate in Groundwater,
W75-01247 5B

The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

FATHEAD MINNOWS
Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

FEDERAL GOVERNMENT
EXPRO '75, A Listing of Extramural Projects to be Funded in Fiscal Year 1975.
W75-01313 9D

Flood Insurance and Disaster Assistance.
W75-01341 6F

Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

FEDERAL PROJECT POLICY
Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

FEDERAL WATER POLLUTION CONTROL ACT
Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

FEEDING RATES
Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

FERMENTATION
How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

FIBERS (PLANT)
Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

FIELD DATA
Data for Border Irrigation Models,
W75-01120 3F

FILTER PRESSES
Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

FILTERS
Sewage Treatment Apparatus,
W75-01186 5D

Water Purification Means,
W75-01193 5D

Filtering and Concentrating Means and Method,
W75-01650 5D

FILTRATION
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

Water Purification Means,
W75-01193 5D

Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

Water Treatment Sludge Filtration Studies,
W75-01392 5D

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

FINANCING
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

FINITE ELEMENT ANALYSIS
Analog Subroutines for the Finite Element Method,
W75-01320 4B

Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

FINLAND
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

FINLAND (LAKE SAIMAA)
Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

FISH
Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

Effects of Acidification of Swedish Lakes,
W75-01473 5C

FISH BEHAVIOR
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

FISH DIETS
Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

FISH DISEASES
Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

FISH EGGS
Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

FISH PHYSIOLOGY
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

FISH POPULATIONS
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

FISH REPRODUCTION
Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

FISHERIES
Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

FLATHEAD AND LAKE COUNTIES (MONT)
Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

FLAX POND (LONG ISLAND-NY)
Flax Pond: An Estuarine Marsh,
W75-01513 5C

FLOATING BRIDGE
I-90 Lake Washington Circulation Study.
W75-01134 5G

FLOATS
Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

FLOCCULATION
Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

FLOOD CONTROL
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Multireservoir Optimization Model,
W75-01226 4A

Flood Hazards in Vermont (A Strategy for Abatement),
W75-01290 4A

Flood Control in Reservoirs and Storage Pounds--A Discussion,
W75-01301 4A

Systematization of Flood Control Measures,
W75-01302 4A

Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

FLOOD FORECASTING
Systematization of Flood Control Measures,
W75-01302 4A

Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

FLOOD FREQUENCY
Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

Progress Report on Flood-Frequency Synthesis for Small Streams in Alabama,
W75-01350 2E

FLOOD INSURANCE
Flood Insurance and Disaster Assistance.
W75-01341 6F

FLOOD PEAK
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

FLOOD PLAINS
Flood Hazards in Vermont (A Strategy for Abatement),
W75-01290 4A

Systematization of Flood Control Measures,
W75-01302 4A

Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

FLOOD PROTECTION
Storm Drainage System Design and New City Planning,
W75-01253 8A

Status Report on the Water Levels of the Great Lakes.
W75-01340 6E

FLOOD ROUTING
Flood Control in Reservoirs and Storage Pounds--A Discussion,
W75-01301 4A

FLOODING
Drainage System,
W75-01188 8B

The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

Floods as a Supplying Factor for Water Resources,
W75-01460 4A

FLOODS
Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

Flood Insurance and Disaster Assistance.
W75-01341 6F

Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

Floods as a Supplying Factor for Water Resources,
W75-01460 4A

Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

FLORIDA
The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

Water Needs of Florida Citrus,
W75-01222 3F

Measure of Water Stress in Citrus,
W75-01223 3F

Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

FLOW AUGMENTATION
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

FLOW MEASUREMENT
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

FLOW NETS
Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

FLOW RATES
Water and Waste Flow Measurement,
W75-01262 7B

FLOWMETERS
Water and Waste Flow Measurement,
W75-01262 7B

FLUCTUATIONS
Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

FLUID INJECTORS
Automated Fluid Injector,
W75-01625 7B

FLUORIDES
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

FOAM SEPARATION
Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

FOOD AND AGRICULTURE ORGANIZATION
Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

FORECASTING
A Prognosis for a Lake,
W75-01506 5C

The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

FOREIGN COUNTRIES
World Meteorological Organization Activities in Central America,
W75-01449 6E

FOREST SOILS
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

FOREST WATERSHEDS
A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

FOURCHE LAFAVE RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

FOURIER ANALYSIS
A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

FRANCE
Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

FRAZIL ICE
Conceptual Design of a Multipurpose Instrument for Winter Stream Metering,
W75-01587 7B

FREEZE CRYSTALLIZATION
Freeze Crystallization of Saline Water with a Direct Contact Refrigerant,
W75-01197 3A

FREEZING
Thermo-Osmotic Soil Moisture Transfer Upon Freezing,
W75-01534 2C

FRESHWATER ANIMALS
Freshwater Ecology,
W75-01475 5C

FROST ACTION
Thermo-Osmotic Soil Moisture Transfer Upon Freezing,
W75-01534 2C

FROZEN GROUND
Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

FULVIC ACIDS
Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

FUNGICIDES
Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

FUR SEALS
Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

GAGES
Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

GAGING STATIONS
Stream Gauging Information, Australia--Supplement 1972.
W75-01311 7C

GALERKIN'S METHOD
Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

GAMMA-RAY SPECTROMETRY
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

GAMMA RAYS
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

GANGES-BRAHMAPUTRA RIVER BASINS
Some Possibilities for International Development of the Ganges-Brahmaputra River Basins,
W75-01441 6B

GAS CHROMATOGRAPHY
Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

GEOLOGIC UNITS
Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

GEORGIA
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

GEOTHERMAL STUDIES
Geothermal Resources.
W75-01342 4B

GERMANY (KIEL BIGHT)
A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

GLACIERS
Ice Sheets and Glaciers,
W75-01167 2C

Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

The I.H.D. World Glacier Inventory,
W75-01541 2C

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

GLACIOHYDROLOGY
Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

GLACIOLOGY
Ice Sheets and Glaciers,
W75-01167 2C

GLOBAL SYSTEM
Global Action for Man's Water Resources,
W75-01429 6F

GONOSOMATIC INDICES
Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

GOODRICH EQUATION
Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

GRADIENTS (STREAMS)
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

GRANTS
Desert Research Institute, Annual Report, 1970-1971.
W75-01202 9D

EXPRO '75, A Listing of Extramural Projects to be Funded in Fiscal Year 1975.
W75-01313 9D

Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

GRAPEVINES
Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

GRAZING
Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

GREAT LAKES
Status Report on the Water Levels of the Great Lakes.
W75-01340 6E

Ice Information Collection, Dissemination and Uses on the Great Lakes,
W75-01556 7C

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

GROUNDWATER
Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

GROUNDWATER

Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

Water in the Methow River Basin, Washington,
W75-01181 4A

Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

The Occurrence of Nitrate in Groundwater,
W75-01247 5B

Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

Bermuda Tunnels for Fresh Water,
W75-01464 4B

Drain Construction Under High Groundwater Level Conditions (O Stroitel 'Stve Drenazha v Usloviyakh Vysokogo Uronnya Gruntovykh Vod),
W75-01629 8A

GROUNDWATER BASINS

Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

GROUNDWATER MOUNDS

Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

GROUNDWATER MOVEMENT

Some Applications of Statistical Methods to Ground-Water Flow System Analysis,
W75-01211 2F

Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

GROUNDWATER RECHARGE

Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

Determination of Groundwater Recharge with Tritium,
W75-01299 2G

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Some Water Resources Problems and Human Environment,
W75-01436 4A

GROUNDWATER RESOURCES

Groundwater Management and Salinity Control,
W75-01117 4B

Ground Water Assessment and Development in Developing Countries,
W75-01457 4B

GROWTH RATE

Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

GROWTH RATES

Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

GRUNION

Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

GUAIACOL

Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

GULF OF CALIFORNIA

Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

GULL LAKE (MICH)

Gull Lake: Past, Present, Future.
W75-01327 5B

HABITATS

Mechanical and Habitat Manipulation for Aquatic Plant Management,
W75-01481 5C

HARBOR SEALS

Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

HARDWOODS

Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

HASKELL COUNTY (KANSAS)

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

HEAT FLOW

Surface Heat Loss From Cooling Ponds,
W75-01296 1A

HEAT LOSS

Surface Heat Loss From Cooling Ponds,
W75-01296 1A

HEAT OF VAPORIZATION

Measurement of Soil Moisture by Use of the Latent Heat of Vaporization,
W75-01334 2G

HEAT PROBES

Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

HEAT TRANSFER

An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

HEATED WATER

Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

HEAVY METALS

Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

HERBICIDE
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

HERBICIDES
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

Different Sensitivity of Photosynthesis and Transpiration to Some Herbicides and Transpiration Inhibitors,
W75-01615 3F

HIGHWAY EFFECTS
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

HIGHWAYS
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

HISTORY
The Hydrological Cycle--Historical Evolution of the Concept,
W75-01157 2A

Development of Hydrology in North America,
W75-01158 2A

HOLLISTER VALLEY (CALIF)
Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

HOT SPRINGS
Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

HUMAN ENVIRONMENT
Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

The Consequences of Building Dams on the Environment,
W75-01431 6G

Some Water Resources Problems and Human Environment,
W75-01436 4A

Organizational Basis of International Co-Operation in Development of Water Resources and Quality of Human Environment,
W75-01440 6E

A Water Storage Method Based on Human Environment,
W75-01469 3B

HUMUS
Some Chemical Aspects of the Humus of Underwater Sediments, (In Spanish),
W75-01603 2J

HYDRAULIC CONDUCTIVITY
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

HYDRAULIC DESIGN
Design of a Combined Sewer Overflow Regulator Concentrator,
W75-01631 5D

HYDRAULIC GEOMETRY
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

HYDRAULIC MODELS
Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

HYDRAULIC STRUCTURES
Soil-Cement for Water Control Structures,
W75-01470 8F

HYDRAULICS
Multireservoir Optimization Model,
W75-01226 4A

Systematization of Flood Control Measures,
W75-01302 4A

HYDROELECTRIC POWER
Multireservoir Optimization Model,
W75-01226 4A

HYDROGEOLOGY
Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

Hydrogeology of Southeastern Connecticut,
W75-01165 7C

Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

HYDROGRAPH ANALYSIS
Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

HYDROGRAPHS
Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

HYDROLOGIC ASPECTS
Some Possibilities for International Development of the Ganges-Brahmaputra River Basins,
W75-01441 6B

HYDROLOGIC CYCLE
Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

HYDROLOGIC DATA
An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

A New California Department of Water Resources Telemetry System,
W75-01552 7B

HYDROLOGIC MODELS
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

HYDROLOGIC SYSTEMS
Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

HYDROLOGY
The Hydrological Cycle--Historical Evolution of the Concept,
W75-01157 2A

Development of Hydrology in North America,
W75-01158 2A

HYDROSTATIC PRESSURE
Microelectrodes Suitable for Use in Cells with High Hydrostatic Pressure,
W75-01596 7B

HYPOXYLON PRUINATUM
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

ICE
Ice Sheets and Glaciers,
W75-01167 2C

Advanced Concepts and Techniques in the Study of Snow and Ice Resources.
W75-01522 2C

Channels in Ice,
W75-01543 2C

Ice and Icebreakers,
W75-01544 2C

Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

ICE BREAKUP
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

ICE COVER
Channels in Ice,
W75-01543 2C

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

The Role of Satellites in Snow and Ice Measurements,
W75-01564 7B

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

Remote Sensing Applications in Canadian Ice Reconnaissance,
W75-01570 7B

ICEBREAKERS
Ice and Icebreakers,
W75-01544 2C

ICED LAKES
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

Ice Information Collection, Dissemination and Uses on the Great Lakes,
W75-01556 7C

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

ILAWA LAKES (POLAND)
Production of Bacterial Biomass in the Water of the Ilawa Lakes,
W75-01488 5C

ILLINOIS
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

IMPERIAL VALLEY (CALIF)
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

INDIA (NATIONAL WATER GRID)
Interbasin Transfer of Water,
W75-01452 4A

INDIA (PULICAT LAKE)
Preliminary Studies on the Primary Production and its Relation to Fisheries of the Pulicat Lake,
W75-01105 5C

INDIANA
Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

INDOLE
Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

INDUSTRIAL WASTE WATER
Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

INDUSTRIAL WASTES
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

Effects of Wastewater Surcharges,
W75-01330 5G

Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

INDUSTRIAL WATER
A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

INDUSTRIES
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

INFILTRATION
For a Modified Theory of Infiltration. 2nd Part How, (Pour une theorie modifiee de l' infiltration. 2 eme partie: Comment),
W75-01220 2G

On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

INFILTRATION RATES
Derivation of an Equation of Infiltration,
W75-01126 2G

Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

INFORMATION RETRIEVAL
WAMIS--An Aid in Locating Information,
W75-01219 10A

INFRARED RADIATION
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

INORGANIC COMPOUNDS
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

INSECT CONTROL
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

INSECTICIDES
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

INSTITUTIONS
Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

Water Management Problems,
W75-01434 6E

INSTRUMENTATION
Radiotelemetry of Hydrometerological Data,
W75-01214 7B

Water and Waste Flow Measurement,
W75-01262 7B

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet

zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

Advanced Concepts and Techniques in the Study of Snow and Ice Resources.
W75-01522 2C

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

Conceptual Design of a Multipurpose Instrument for Winter Stream Metering,
W75-01587 7B

An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

The Snow Moisture Integrator,
W75-01590 7B

Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

Instrumentation for Water Quality Monitoring,
W75-01620 5A

INTER-BASIN TRANSFERS
Interbasin Transfer of Water,
W75-01452 4A

International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

INTERDISCIPLINARY MODELLING
Problems Encountered in Multidisciplinary Resources and Environmental Simulation Models Development,
W75-01500 6A

INTERFEROGRAMS
Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

INTERFEROMETRY
An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

INTERNATIONAL ASSOCIATION
The International Association on Water Pollution Research,
W75-01446 5G

INTERNATIONAL COOPERATION
Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

INTERNATIONAL HYDROLOGICAL DECADE
Advanced Concepts and Techniques in the Study of Snow and Ice Resources.
W75-01522 2C

The I.H.D. World Glacier Inventory,
W75-01541 2C

INTERNATIONAL JOINT COMMISSION
Status Report on the Water Levels of the Great Lakes.
W75-01340 6E

INTERNATIONAL LAW
The Latin American Approach to the Law of the Sea,
W75-01346 6E

Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

INTERNATIONAL WATER MANAGEMENT
Water Management Problems,
W75-01434 6E

INTERNATIONAL WATERS
Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

INTERTIDAL AREAS
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

INVASION
The Effect of an Influx of New Species on the Diversity of Protozoan Communities,
W75-01486 5C

Seaweed Invasion,
W75-01492 5C

INVERTEBRATES
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

INVESTIGATIONS
Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

ION EXCHANGE
The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

ION TRANSPORT
The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

IOWA
Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

IRON COMPOUNDS
Appearance and stability of hydrolyzed Fe(C104)3 solutions,
W75-01102 5B

IRONOXIDE
Appearance and stability of hydrolyzed Fe(C104)3 solutions,
W75-01102 5B

IRRADIATION
Irradiator for Water Purification,
W75-01189 5D

IRRIGABLE LAND
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

IRRIGATION
Groundwater Management and Salinity Control,
W75-01117 4B

Multireservoir Optimization Model,
W75-01226 4A

Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

IRRIGATION DITCHES
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

IRRIGATION EFFECTS
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

IRRIGATION WATER
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

ISOCITRIC DEHYDROGENASE
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

ISOPHOS-2
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

ISRAEL
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

ISRAEL (LAKE KINNERET)
Extension of Israel's National Water System as a Function of Artificial Rainfall Prospects,
W75-01297 2A

JELLY FISH
Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

JEMEZ MOUNTAINS (NM)
Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

JET MIXING
Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

JURISDICTION
The Latin American Approach to the Law of the Sea,
W75-01346 6E

KANAPAHA FINE SANDS
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

KANSAS
Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

KINETICS
A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Generalization, Typification, and Kinetic Analysis of the Biochemical Oxygen Demand Curves Based on BOD-Experiments (Obobshcheniye, titizatsiya i kineticheskiy analiz krivykh potrebleniya kisloroda po dannym BPK-opytov),
W75-01647 5A

L'ANGUILLE RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

LAGOONS
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

LAKE CHAMPLAIN (VT)
Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

LAKE COUNTY (INDIANA)
Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

LAKE GEORGE (NY)
Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

LAKE ICE
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

Channels in Ice,
W75-01543 2C

Ice and Icebreakers,
W75-01544 2C

Ice Information Collection, Dissemination and Uses on the Great Lakes,
W75-01556 7C

Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

LAKE KINNERET (ISRAEL)
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

LAKE MICHIGAN
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

LAKE MONONA (WIS)
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

LAKE MONONA (WISC)
Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

LAKE ONTARIO
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

LAKE POWELL (ARIZ)
Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

LAKE RESTORATION
A Prognosis for a Lake,
W75-01506 5C

LAKE SAWYER
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

LAKE SEDIMENTS
Determination of Mercury from Lake Sediments,
W75-01598 5A

LAKE ST. CLAIR (MICH)
Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

LAKE WASHINGTON
I-90 Lake Washington Circulation Study.
W75-01134 5G

Freeway Runoff from the I-90 Corridor,
W75-01135 5C

Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

LAKES
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

Comparative Evaluation of Two Methods of Calculating Production Exemplified by the Zooplankton of Lake Ilmen, (In Russian),
W75-01394 5C

Freshwater Ecology,
W75-01475 5C

Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

A Prognosis for a Lake,
W75-01506 5C

Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

LAKES MARY (WISC)
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

LAND APPLICATION
Land Application of Wastewater,
W75-01141 5D

LAND MANAGEMENT
WAMIS--An Aid in Locating Information,
W75-01219 10A

Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

LAND USE
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

LANDSCAPING
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

LARVICIDES
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

LATENT HEAT
Measurement of Soil Moisture by Use of the Latent Heat of Vaporization,
W75-01334 2G

LAW OF THE SEA
The Latin American Approach to the Law of the Sea,
W75-01346 6E

LAYERED SOILS
Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

LEAD
The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

LEAVES
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

LEGISLATION
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

A Citizen's Guide to Clean Water.
W75-01339 5G

Flood Insurance and Disaster Assistance.
W75-01341 6F

Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

LEONTIEF MODELS
Mass Balance and Economic Models,
W75-01388 6A

LEPOMIS MACROCHIRUS
Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

LETHAL LIMIT
Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

LEURESTHES SARDINA
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

LIGHT
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

LIGHT INTENSITY
The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

LIGNINS
Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

LIMITING FACTORS
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

LIMNOLOGY
I-90 Lake Washington Circulation Study.
W75-01134 5G

LINDANE
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

LINEAR PROGRAMMING
Screening Model for Storm Water Control,
W75-01110 5D

LININGS
Soil-Cement for Water Control Structures,
W75-01470 8F

LIQUIDS
Strainer Device for Liquids,
W75-01637 5D

LITTLE BROOKLYN LAKE (WYO)
Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

LITTORAL
Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

LIVERMORE VALLEY (CALIF)
Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

LOADS (FORCES)
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

LOTIC ENVIRONMENT
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

LOUISIANA
Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

LOW FLOW
The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

LOW FLOW AUGMENTATION
Multireservoir Optimization Model,
W75-01226 4A

LYMPHOCYSTIS
Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

MACON (GA)
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

MAGNESIUM
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

MAGNETIC STUDIES
Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

MAINE
PE Pipe Used at Oxford Paper.
W75-01371 5D

MALATHION
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

MANAGEMENT
Groundwater Management and Salinity Control,
W75-01117 4B

Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

International Cooperation in Developing Water Resources,
W75-01439 6E

Planning for Water Resource Management,
W75-01456 6B

Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

MAPPING
Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

MAPS
Hydrogeology of Southeastern Connecticut,
W75-01165 7C

Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

MARIN COUNTY (CALIFORNIA)
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

MARINE BIOLOGY
The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

MARINE FISH
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

MARINETTE COUNTY (WIS)
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

MARKET VALUES
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

MARKOV PROCESSES
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

MARMOT CREEK EXPERIMENTAL WATERSHED (CANADA)
A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

MARSHES
Flax Pond: An Estuarine Marsh,
W75-01513 5C

MARYLAND
Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

MASS BALANCE
Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

MASS BALANCE (ACCOUNTING)
Mass Balance and Economic Models,
W75-01388 6A

MASSACHUSETTS
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

MASSACHUSETTS BAY
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

MATHEMATICAL MODELS
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

Progress Report on Flood-Frequency Synthesis for Small Streams in Alabama,
W75-01350 2E

Eutrophication: A Mathematical Model,
W75-01385 5C

Interbasin Transfer of Water,
W75-01452 4A

Phosphorus Model of Lake Eutrophication,
W75-01496 5C

The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

MATHEMATICAL STUDIES

Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

MATRIX METHODS

Analog Subroutines for the Finite Element Method,
W75-01320 4B

MAXIMUM PARTIAL SUM

Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

MAYFLIES

Drifting Behavior of Ephemerella Ignita (Ephemeroptera), (In German),
W75-01636 2I

MEANDERS

Flow and Bed Topography in Channel Bends,
W75-01308 8B

MEASUREMENT

The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

Measurement of Soil Moisture by Use of the Latent Heat of Vaporization,
W75-01334 2G

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

MELBOURNE (VIC)

Urban Water Use in Australia,
W75-01254 6D

MELT WATER

The Occurrence and Movement of Liquid Water in the Snowpack,
W75-01529 2C

MEMBRANE FILTERS

A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

MERCURY

Mercury in Waters of the Western United States,
W75-01166 5B

Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

Determination of Mercury from Lake Sediments,
W75-01598 5A

MERCURY COMPOUNDS

Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

METABOLISM

Variability of Relationships Between Transpiration, Shoot and Root Metabolism, and Nutrient Uptake in Intake Plants,
W75-01616 2D

METALS

Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

METEOR BURST COMMUNICATION

Meteor Burst Communication,
W75-01593 7B

METEOROLOGICAL DATA

A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

METEOROLOGY

On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

Radiotelemetry of Hydrometerological Data,
W75-01214 7B

METHOD OF SLICES

The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

METHODOLOGY

Blue-Green Algal Genetics: A New Methodology,
W75-01514 5C

METHOW RIVER BASIN (WASH)

Water in the Methow River Basin, Washington,
W75-01181 4A

MEXICO

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

MICHIGAN

The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

MICHIGAN

Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Gull Lake: Past, Present, Future.
W75-01327 5B

Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

MICROBIAL COMMUNITY PRODUCTION

Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

MICROBIAL DEGRADATION

Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II. Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

MICROWAVE RADIOMETRY

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

MICROWAVES

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

MIKOLAJSKIE LAKE (POLAND)

Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

MILDEWS

Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

MILFORD (UTAH)

Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

MINE WASTES

Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

MINNESOTA

The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in South-Central Minnesota.
W75-01389 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Northwestern Minnesota.
W75-01390 6B

MIRACIDIA

The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

MISSISSIPPI RIVER

Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

MISSISSIPPI RIVER BASIN

Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

MISSOURI

Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

MIXED BENCH REACTOR

Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

MIXING

Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

MODEL STUDIES

Data for Border Irrigation Models,
W75-01120 3F

A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

Hydrogeology of Southeastern Connecticut,
W75-01165 7C

Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Digital Simulation Language for Distributed Parameter System Identification,
W75-01321 7C

Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

Eutrophication: A Mathematical Model,
W75-01385 5C

Mass Balance and Economic Models,
W75-01388 6A

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

Problems Encountered in Multidisciplinary Resources and Environmental Simulation Models Development,
W75-01500 6A

Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

MOISTURE

The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

MOISTURE CONTENT

Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

MOISTURE STRESS

Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

MOISTURE UPTAKE

Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

MOLECULAR STRUCTURE
Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

MOLLUSKS
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

MONITORING
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

Water and Waste Flow Measurement,
W75-01262 7B

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

MONTANA
Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

MOSQUITO CONTROL
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

MOSQUITOES
Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

MOUGEOTIA
Microelectrodes Suitable for Use in Cells with High Hydrostatic Pressure,
W75-01596 7B

MOUNTAINS
Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

MUD
An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

MUD BOTTOM SAMPLERS
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

MUD-WATER INTERFACES
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

MULTIPLE-PURPOSE PROJECTS
International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

MULTIPLE-PURPOSE RESERVOIRS
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

Multireservoir Optimization Model,
W75-01226 4A

MULTIPLE-WELL SYSTEMS
Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

MUNICIPAL WASTES
Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

Effects of Wastewater Surcharges,
W75-01330 5G

MUNICIPAL WATER
Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

Examples of the Effective Use of Plastic Materials in a Municipal Water Supply and Waste Water Treatment Plant (Beispiele der effektiven Plastanwendung in einem VEB Wasserversorgund und Abwasserbehandlung),
W75-01638 5D

MYSIDAE
A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

NAHUEL HUAPI (ARGENTINA)
Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

NATIONAL PARKS
The Geologic Story of Canyonlands National Park,
W75-01163 6B

NATIONAL POLICY
A National Policy for Phosphate Control in the Environment,
W75-01495 5C

NATURAL RECHARGE
Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

NATURAL RESOURCES
Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration,
W75-01349 6E

Water and the Energy Crisis,
W75-01430 4A

NAVIGATION
Ice and Icebreakers,
W75-01544 2C

NAWAPA PROJECT
International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

NEBRASKA
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

NETWORKS
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

NEUSE RIVER (NC)
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

NEVADA
Desert Research Institute, Annual Report, 1970-1971.
W75-01202 9D

NEW HAMPSHIRE
Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

NEW MEXICO
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

NEW SOUTH WALES
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

NEW YORK
Quality of Public Water Supplies of New York, November 1970-April 1972.
W75-01170 5B

A Study of Chemicals in Drinking Water from Selected Public Water Systems, New York State, October 1970 to March 1971.
W75-01182 5A

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

NEW YORK CITY REGIONAL AREA
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

NEW ZEALAND
A Water Balance Assessment of the New Zealand Rainfall,
W75-01305 2A

Survey of New Zealand Tank Evaporation,
W75-01307 2D

NIGERIA
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

NITELLA-TRANSLUCENS
Microelectrodes Suitable for Use in Cells with High Hydrostatic Pressure,
W75-01596 7B

NITRATES
The Occurrence of Nitrate in Groundwater,
W75-01247 5B

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

NITRIFICATION
Zones of Nitrification,
W75-01103 5B

A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

NITROBACTER
Zones of Nitrification,
W75-01103 5B

NITROGEN
Experimental Study of Ammonification in Aquatic Environments (In French),
W75-01132 5B

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Nitrogen: A Problem of Decreasing Dilution,
W75-01502 5B

NITROSOMONAS
Zones of Nitrification,
W75-01103 5B

NON-LINEAR PROGRAMMING
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

NORRIS LAKE (TENN)
A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

NORTH AMERICA
Development of Hydrology in North America,
W75-01158 2A

NORTH CAROLINA
Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

Effects of Wastewater Surcharges,
W75-01330 5G

Annual Report July 1971 Through December 1972,
W75-01348 6B

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

NORTHEASTERN MICHIGAN
The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

NUCLEAR EXPLOSIONS
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

NUCLEAR MOISTURE METERS
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

NUMERICAL ANALYSIS
Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

NUTRIENT REGENERATION
Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

NUTRIENT REMOVAL
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

Advanced Waste Water Treatment (Part II),
W75-01249 5D

NUTRIENT REQUIREMENTS
Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Eutrophication: A Mathematical Model,
W75-01385 5C

NUTRIENT UPTAKE (PLANTS)
Variability of Relationships Between Transpiration, Shoot and Root Metabolism, and Nutrient Uptake in Intake Plants,
W75-01616 2D

NUTRIENTS
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

NYMPHAEA ODORATA
Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

OATS
Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

OCEANS
The Latin American Approach to the Law of the Sea,
W75-01346 6E

The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration,
W75-01349 6E

OCMULGEE RIVER (GA)
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

OHIO
Screening Model for Storm Water Control,
W75-01110 5D

OIL
Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

OIL POLLUTION
Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

OIL RECOVERY
Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

OIL SPILLS
Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

Oil Spill Recovery Vessel.
W75-01633 5G

OIL WASTES
A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

OKLAHOMA
Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

ON-SITE DATA COLLECTIONS
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

ON-SITE INVESTIGATIONS
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

ONCORHYNCHUS SSP.
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

OPEN CHANNEL FLOW
Flow and Bed Topography in Channel Bends,
W75-01308 8B

OPEN SPACE
The Delaware Valley Plan.
W75-01137 6D

OPERATING COSTS
Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

OPERATION COSTS
Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

OPTICAL PROPERTIES
Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

OPTIMIZATION
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

Multireservoir Optimization Model,
W75-01226 4A

Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

Mass Balance and Economic Models,
W75-01388 6A

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

OPTIMUM DEVELOPMENT PLANS
An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

OREGON
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

ORGANIC ACIDS
Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

ORGANIC COMPOUNDS
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

ORGANIC LOADING
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

ORGANIC MATTER
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

ORGANIC WASTES
Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

ORGANIZATIONS
The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

Organizational Basis of International Co-Operation in Development of Water Resources and Quality of Human Environment,
W75-01440 6E

The International Association on Water Pollution Research,
W75-01446 5G

Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

World Meteorological Organization Activities in Central America,
W75-01449 6E

ORGANOPHOSPHORUS PESTICIDES
Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

ORIENTATION RESPONSES
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

OROGRAPHY
Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

ORTHOPHOSPHATES
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

OXIDATION
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

OXIDATION LAGOONS
Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

OXYGEN
A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

OXYGEN PRODUCTION
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

OXYGEN SAG
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

OXYGENATION
Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

OZONE
Ozonation of a Kraft Mill Effluent,
W75-01279 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

PACIFIC OCEAN
Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

PAINTS
Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

PARALLEL DITCHES
Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

PARAMYSIS-INTERMEDIA
A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

PARLANGE'S METHOD
On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

PATAGONIA
Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

PATENTS
Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

Water Still,
W75-01185 5F

Sewage Treatment Apparatus,
W75-01186 5D

Sewage Treatment Apparatus,
W75-01187 5D

Drainage System,
W75-01188 8B

Irradiator for Water Purification,
W75-01189 5D

Treatment and Use of Waste Effluent Streams,
W75-01190 5D

Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

Water Purification Means,
W75-01193 5D

Treatment for Waste Water or the Like,
W75-01194 5D

Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

Freeze Crystallization of Saline Water with a Direct Contact Refrigerant,
W75-01197 3A

Littoral Flow Trap or Basin,
W75-01198 8B

Automated Fluid Injector,
W75-01625 7B

Sewage and Effluent Treating System,
W75-01632 5D

Oil Spill Recovery Vessel.
W75-01633 5G

Clarifying Tank for Effluents.
W75-01634 5D

Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

Strainer Device for Liquids,
W75-01637 5D

Filtering and Concentrating Means and Method,
W75-01650 5D

PATH OF POLLUTANTS
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

PATHOGENS
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

PEACHES
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

PEAK DISCHARGE
Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

PEARS
Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

PECAN LEAVES
Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

PENETRATION
Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

PENMAN EQUATION
Survey of New Zealand Tank Evaporation,
W75-01307 2D

PERMAFROST
Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

PERMEABILITY
Derivation of an Equation of Infiltration,
W75-01126 2G

PESTICIDE RESIDUES
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

PESTICIDES
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

PETIT JEAN RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

PHENOLS
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

PHOSPHATES
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

A National Policy for Phosphate Control in the Environment,
W75-01495 5C

PHOSPHOROUS
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

PHOSPHOROUS COMPOUNDS
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

PHOSPHORUS
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

Gull Lake: Past, Present, Future.
W75-01327 5B

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Report of the Water Management Sector Group on Eutrophication Control.
W75-01476 5C

Phosphorus Model of Lake Eutrophication,
W75-01496 5C

PHOSPHORUS COMPOUNDS
Phosphorus Compounds in Corn Tissues Under Unfavorable Conditions of Moistening, (In Russian),
W75-01151 3F

PHOTOGRAMMETRY
Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

PHOTOPLANKTON
The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

PHOTOSYNTHESIS
Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

Different Sensitivity of Photosynthesis and Transpiration to Some Herbicides and Transpiration Inhibitors,
W75-01615 3F

PHREATOPHYTES
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

PHYSICAL PROPERTIES
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

PHYTONCIDES
Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

PHYTOPLANKTON
The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

Preliminary Studies on the Primary Production and its Relation to Fisheries of the Pulicat Lake,
W75-01105 5C

A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

Eutrophication: A Mathematical Model,
W75-01385 5C

Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

PHYTOPLANKTON

Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

PICKWICK LAKE (ALA)

Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

PILOT PLANTS

Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

PINE TREES

A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

PINUS RADIATA

A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

PIPELINES

PE Pipe Used at Oxford Paper.
W75-01371 5D

Pipeline Network Calculations Using Sparse Computation Techniques,
W75-01626 8A

PIPES

Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

PITHLACHASCOTEE RIVER (FLA)

The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

PLANKTON

Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

PLANKTON PRODUCTION

Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

Comparative Evaluation of Two Methods of Calculating Production Exemplified by the Zooplankton of Lake Ilmen, (In Russian),
W75-01394 5C

PLANNING

Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

Use of Systems Approach in Water Resources Planning,
W75-01112 6A

A Process for Federal Water Planning at the Field Level,
W75-01115 6A

Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

The Delaware Valley Plan.
W75-01137 6D

Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

Mass Balance and Economic Models,
W75-01388 6A

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Global Action for Man's Water Resources,
W75-01429 6F

Water and the Energy Crisis,
W75-01430 4A

The Consequences of Building Dams on the Environment,
W75-01431 6G

Warming of the World's Waters by Man,
W75-01432 5C

Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

International Cooperation in Developing Water Resources,
W75-01439 6E

Regional Systems and Hydraulic Grids,
W75-01443 6A

Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

Interbasin Transfer of Water,
W75-01452 4A

International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

Integrated Approach to Water Resources Development in Water Scarce Countries,
W75-01454 6B

Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

Planning for Water Resource Management,
W75-01456 6B

Ground Water Assessment and Development in Developing Countries,
W75-01457 4B

Indian National Water Plan and Grid,
W75-01458 6B

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

PLANT BIOCHEMISTRY

Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

PLANT DISEASES
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

PLANT POPULATION
Vegetation of the Earth in Relation to Climate and Eco-Physiological Conditions,
W75-01116 2I

PLANT VIRUSES
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

PLASTICS
Examples of the Effective Use of Plastic Materials in a Municipal Water Supply and Waste Water Treatment Plant (Beispiele der effektiven Plastanwendung in einem VEB Wasserversorgund und Abwasserbehandlung),
W75-01638 5D

PLATEAU BOD VALUES
The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

PLATTE RIVER VALLEY (NEB)
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

PLAYAS
Geology of Salars in Northern Chile,
W75-01351 2H

PLOVER COVE RESERVOIR (HONG KONG)
Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

POINT RAINFALL
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

POISSON LINE MODEL
Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

POLITICAL ASPECTS
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

POLLUTANT IDENTIFICATION
The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

Determination of the Radon Content in Water by a Widely Used Instrument, (In Russian),
W75-01153 5A

Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

Determination of Mercury from Lake Sediments,
W75-01598 5A

Possibilities of the 'Carbon Rod' Technique for the Determination of Trace Elements in Water by Atomic Absorption,
W75-01619 5A

Instrumentation for Water Quality Monitoring,
W75-01620 5A

Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

Determination of Chromium in Water and Waste Water (Bestimmung des Chroms in Wasser und Abwasser),
W75-01641 5A

Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

POLLUTION ABATEMENT
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

Oil Spill Recovery Vessel.
W75-01633 5G

POLLUTION CONTROL
Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

POLLUTION TAXES (CHARGES)
Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

Effects of Wastewater Surcharges,
W75-01330 5G

POLYCHLORINATED BIPHENYLS
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

POPLAR TREES
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

POPULUS TREMULOIDES
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

PORE SIZE
Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

PORE WATER
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

POROUS MEDIA
Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

PORPHYRA TENERA
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

PORTER COUNTY (INDIANA)
Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

POTABLE WATER
Quality of Public Water Supplies of New York, November 1970-April 1972.
W75-01170 5B

A Study of Chemicals in Drinking Water from Selected Public Water Systems, New York State, October 1970 to March 1971.
W75-01182 5A

Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

Clear-Span Domes Cover Water Tanks.
W75-01639 5G

POTASSIUM RADIOISOTOPES
Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

POTATO BLIGHT
Epidemiological Patterns of Phytophthora Infestans Under Semi-Arid Conditions,
W75-01610 3F

POTEAU RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

POWER PLANTS
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

POWERPLANTS
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Geothermal Resources.
W75-01342 4B

PRECIPITATION ENHANCEMENT
Extension of Israel's National Water System as a Function of Artificial Rainfall Prospects,
W75-01297 2A

PRECIPITATION GAGES
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

The Snow Moisture Integrator,
W75-01590 7B

PRESSURE BOMB MEASUREMENT
Measure of Water Stress in Citrus,
W75-01223 3F

PRESSURE RIDGES (SEA ICE)
Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

PRIMARY PRODUCTION
Preliminary Studies on the Primary Production and its Relation to Fisheries of the Pulicat Lake,
W75-01105 5C

PRIMARY PRODUCTIVITY
Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

PROBABILITY
Extension of Israel's National Water System as a Function of Artificial Rainfall Prospects,
W75-01297 2A

PRODUCTION
An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

PRODUCTION FUNCTION
An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

PRODUCTIVITY
A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

Production of Bacterial Biomass in the Water of the Ilawa Lakes,
W75-01488 5C

PROFILES
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

PROGRAMMING LANGUAGES
Digital Simulation Language for Distributed Parameter System Identification,
W75-01321 7C

PROJECT PLANNING
Advanced Waste Water Treatment,
W75-01248 5D

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Northwestern Minnesota.
W75-01390 6B

Ground Water Assessment and Development in Developing Countries,
W75-01457 4B

PROJECTS
Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

PROTEIN
Amino Acid Composition of Freshwater Algae,
W75-01238 5C

PROTEINS
How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

PROTON MAGNETIC RESONANCE
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

PROTOZOA
The Effect of an Influx of New Species on the Diversity of Protozoan Communities,
W75-01486 5C

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and its Prevention,
W75-01604 5C

PUBLIC HEALTH
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

Nitrogen: A Problem of Decreasing Dilution,
W75-01502 5B

PUBLIC PARTICIPATION
A Citizen's Guide to Clean Water.
W75-01339 5G

PUGET SOUND
Control of Combined Sewer Overflow Events,
W75-01138 5G

A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

PULP AND PAPER INDUSTRY
A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

PULP WASTES
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

Waste from Wastepaper Utilization,
W75-01261 5B

Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

Ozonation of a Kraft Mill Effluent,
W75-01279 5D

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

Disposing of Industrial Wastes: The Paper Industry (Smaltimento rifiuti industriali: Industria della carta),
W75-01379 5D

Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

PUMPS
Compact Waste Water Pumping Systems with High Capacity (Kompakte Abwasserpumpwerke Grosser Leistung),
W75-01628 5D

RADAR
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

Measurement of Snowfall by Radar,
W75-01559 7B

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

RADAR

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

RADIATION

Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

RADIOACTIVE DATING

Determination of Groundwater Recharge with Tritium,
W75-01299 2G

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

RADIOACTIVE WASTES

Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

RADIOACTIVITY TECHNIQUES

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

RADIOISOTOPES

Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

Determination of Groundwater Recharge with Tritium,
W75-01299 2G

RADON

Determination of the Radon Content in Water by a Widely Used Instrument, (In Russian),
W75-01153 5A

RAIN

On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

RAINBOW TROUT

Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

RAINFALL

East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

A Water Balance Assessment of the New Zealand Rainfall,
W75-01305 2A

RAINFALL-RUNOFF RELATIONSHIPS

Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

Progress Report on Flood-Frequency Synthesis for Small Streams in Alabama,
W75-01350 2E

RECIRCULATED WATER

A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

RECLAMATION

Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

RECOVERY

Oil Spill Recovery Vessel.
W75-01633 5G

RECREATION

A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

Multireservoir Optimization Model,
W75-01226 4A

Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

RECREATION DEMAND

The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

RECREATION FACILITIES

The Geologic Story of Canyonlands National Park,
W75-01163 6B

RECYCLING

Waste from Wastepaper Utilization,
W75-01261 5B

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Resource Conservation and Recycling, (Parts I and II).
W75-01343 6G

Water Treatment Sludge Filtration Studies,
W75-01392 5D

RED RIVER (ARK)

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

REFRIGERATION

Freeze Crystallization of Saline Water with a Direct Contact Refrigerant,
W75-01197 3A

REGIONAL ANALYSIS

Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

The Northeast Michigan Regional Planning Handbook.
W75-01147 6F

Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

REGIONAL DEVELOPMENT

The Delaware Valley Plan.
W75-01137 6D

Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

Regional Systems and Hydraulic Grids,
W75-01443 6A

Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

REGRESSION ANALYSIS

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

RELIEF WELLS

Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

REMOTE CONTROL

Meteor Burst Communication,
W75-01593 7B

REMOTE SENSING

Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

Remote Sensing and Snowpack Management,
W75-01294 2C

An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

Ice and Icebreakers,
W75-01544 2C

Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

Measurement of Snowfall by Radar,
W75-01559 7B

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

The Role of Satellites in Snow and Ice Measurements,
W75-01564 7B

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

Remote Sensing Applications in Canadian Ice Reconnaissance,
W75-01570 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

Dielectric Constants in the Management of Freezing Systems,
W75-01594 2C

RESEARCH AND DEVELOPMENT

The International Association on Water Pollution Research,
W75-01446 5G

RESEARCH PRIORITIES

Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Northwestern Minnesota.
W75-01390 6B

RESEARCH PROGRAMS

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Objective, Organization and Extent of Program, (In Swedish),
W75-01599 5G

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Surface Water Quality of Recipients, August-October, 1972, (In Swedish),
W75-01600 5G

RESERVOIR OPERATION

Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

RESERVOIR SILTING

Some Water Resources Problems and Human Environment,
W75-01436 4A

RESERVOIR STAGES

Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

RESERVOIRS

A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

RESPIRATION

Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

REVIEWS

The Hydrological Cycle--Historical Evolution of the Concept,
W75-01157 2A

Development of Hydrology in North America,
W75-01158 2A

Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

Problems of Liquid Waste Disposal,
W75-01252 5D

Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

REYNOLDS NUMBER

Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

RHEOLOGY
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

RHOPALOSIPHUM NUMPHAEAE
Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

RIBOFLAVIN
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

RIBONUCLEIC ACID
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

RIBOSOMES
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

RIPARIAN PLANTS
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

RIPARIAN WATER LOSS
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

RIVER BASINS
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

River Mileage Tabulations for the Colorado River Basin. Communities and Major Tributaries.
W75-01309 7C

Australian Representative Basins Programme--Progress 1973.
W75-01310 7C

Stream Gauging Information, Australia--Supplement 1972.
W75-01311 7C

RIVER BEDS
Flow and Bed Topography in Channel Bends,
W75-01308 8B

RIVER MILEAGE
River Mileage Tabulations for the Colorado River Basin. Communities and Major Tributaries.
W75-01309 7C

RIVERS
Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

ROAD CONSTRUCTION
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

ROCHE METHODOLOGY
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

ROCKFILL DAMS
The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

ROCKY MOUNTAIN REGION
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

ROOTED AQUATIC PLANTS
Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

ROSWELL (NM)
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

ROT
Influence of Restricted Water Supply on Blossom-End Rot and Ionic Composition of Tomatoes Grown in Nutrient Solution,
W75-01612 3F

RUNOFF
Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

RUNOFF FORECASTING
Long-Range Goal and Information Needs of the Coordinated Snow Survey Program in California,
W75-01527 7C

On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

Estimating True Basin Snowcover,
W75-01551 2C

A New California Department of Water Resources Telemetry System,
W75-01552 7B

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

SALARS
Geology of Salars in Northern Chile,
W75-01351 2H

SALINE SOILS
Geology of Salars in Northern Chile,
W75-01351 2H

SALINITY
Groundwater Management and Salinity Control,
W75-01117 4B

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

SALMON
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

SALMONELLAE
Quantitative Method for Enumerating Salmonellae in Surface Waters, (In Russian),
W75-01622 5A

SALMONIDS
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

SALT FLATS
Geology of Salars in Northern Chile,
W75-01351 2H

SALTS
Geology of Salars in Northern Chile,
W75-01351 2H

SAMMAMISH RIVER
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

SAMPLERS
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

SAMPLING
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

SAMPLING DEVICES
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

SAMPLING EFFICIENCY
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

SAMPLING METHODS
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

SAN JUAN VALLEY (CALIF)
Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913r68,
W75-01173 7C

SANDS
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

SARGASSO SEA
Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

SATELLITES (ARTIFICIAL)
Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

The Role of Satellites in Snow and Ice Measurements,
W75-01564 7B

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

SATURATION
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

SCALING
The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

SCENEDESMUS
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

SCHISTOSOMA-MANSONI
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

SCREENING MODELS
Screening Model for Storm Water Control,
W75-01110 5D

SEA ICE
Ice and Icebreakers,
W75-01544 2C

Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

SEA LOCKS
Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

SEA WATER
Seaweed Invasion,
W75-01492 5C

SEASONAL
Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

SEATTLE
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

SEDIMENT LOAD
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

SEDIMENT TRANSPORT
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

SEDIMENT YIELD
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

SEDIMENTS
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

SEEPAGE
Drainage System,
W75-01188 8B

An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

SELENIUM
Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

SELF-PURIFICATION
Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

SEPARATION
Strainer Device for Liquids,
W75-01637 5D

SEPARATION TECHNIQUES
Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

Oil Spill Recovery Vessel.
W75-01633 5G

SEPTIC TANKS
Gull Lake: Past, Present, Future.
W75-01327 5B

SESTON
A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

SETTLING BASINS
Sewage Treatment Apparatus,
W75-01186 5D

SEWAGE
Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II.

SEWAGE

Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

SEWAGE DISPOSAL
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

SEWAGE EFFLUENTS
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

SEWAGE LAGOONS
Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II. Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

SEWAGE SLUDGE
Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

SEWAGE TREATMENT
Sewage Treatment Apparatus,
W75-01186 5D

Sewage Treatment Apparatus,
W75-01187 5D

Irradiator for Water Purification,
W75-01189 5D

Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

Aqua-Sans Sewage Treatment System,
W75-01471 5D

Sewage and Effluent Treating System,
W75-01632 5D

SEWER DISPOSAL
Land Application of Wastewater,
W75-01141 5D

SEWERAGE
Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

Drain Construction Under High Groundwater Level Conditions (O Stroitel 'Stve Drenazha v Usloviyakh Vysokogo Uronnyz Gruntovykh Vod),
W75-01629 8A

Investigation of the Optimal Life of Fixed Capital in Water Supply and Sewer Systems (Az Alloeszkozok Optimalis Elettartamanak Vizsgalata a Vizellatas es Csatornazas Teruleten),
W75-01630 8A

SEWERS
Control of Combined Sewer Overflow Events,
W75-01138 5G

SHERMAN (OKLA)
Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

SHINER (TAILLIGHT)
Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

SHORE PROTECTION
Littoral Flow Trap or Basin,
W75-01198 8B

SHRIMP
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

SILICA
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

SILVER LAKE (MICH)
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

SIMULATION ANALYSIS
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

SINKS
Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

SKIING
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

SKIMMING
Oil Spill Recovery Vessel.
W75-01633 5G

SLUDGE
Waste from Wastepaper Utilization,
W75-01261 5B

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

SLUDGE DISPOSAL
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

SLUDGE TREATMENT
Treatment for Waste Water or the Like,
W75-01194 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

Water Treatment Sludge Filtration Studies,
W75-01392 5D

SLUSH
Channels in Ice,
W75-01543 2C

SMALL WATERSHEDS
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

SNAIL INFECTION
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

SNOW
Advanced Concepts and Techniques in the Study of Snow and Ice Resources.
W75-01522 2C

Cloud Droplet Accretion on Snow Crystals,
W75-01540 2B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

SNOW COVER
Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

Channels in Ice,
W75-01543 2C

The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

Estimating True Basin Snowcover,
W75-01551 2C

The Role of Satellites in Snow and Ice Measurements,
W75-01564 7B

Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

SNOW GAGES
Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

SNOW LOADS
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

SNOW MANAGEMENT
Remote Sensing and Snowpack Management,
W75-01294 2C

Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

SNOW PARTICLE TRANSPORT
Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

SNOW SURVEYS
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

Snowpack and Related Trends in Mountains of the Southwestern United States,
W75-01524 2C

New Concepts in Snow Surveying to Meet Expanding Needs,
W75-01526 7B

Long-Range Goal and Information Needs of the Coordinated Snow Survey Program in California,
W75-01527 7C

Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

Estimating True Basin Snowcover,
W75-01551 2C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

The Snow Moisture Integrator,
W75-01590 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

SNOWFALL
Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

Measurement of Snowfall by Radar,
W75-01559 7B

Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

SNOWMELT
On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

The Occurrence and Movement of Liquid Water in the Snowpack,
W75-01529 2C

Hydrology of Warm Snowpacks and Their Effects Upon Water Delivery--Some New Concepts,
W75-01530 2C

Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

SNOWPACKS
Remote Sensing and Snowpack Management,
W75-01294 2C

Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

Hydrology of Warm Snowpacks and Their Effects Upon Water Delivery--Some New Concepts,
W75-01530 2C

Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

Estimating True Basin Snowcover,
W75-01551 2C

A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

The Snow Moisture Integrator,
W75-01590 7B

Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

SOCIAL ASPECTS
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

SODIUM CHLORATE
Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

SOIL AMENDMENTS
Use of Phosphoric and Sulfuric Acids to Reduce Soil Crusting and Improve Emergence of Sugarbeet (Beta Vulgaris L.) Seedlings,
W75-01386 3F

SOIL ANALYSIS
Methods for Analysis of Irrigated Soils.
W75-01239 2G

SOIL CEMENT
Soil-Cement for Water Control Structures,
W75-01470 8F

SOIL CHEMICAL PROPERTIES
Methods for Analysis of Irrigated Soils.
W75-01239 2G

SOIL DISPOSAL FIELDS
Land Application of Wastewater,
W75-01141 5D

Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

SOIL FILTERS
Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

SOIL INVESTIGATIONS
Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

SOIL MOISTURE
Measurement of Soil Moisture by Use of the Latent Heat of Vaporization,
W75-01334 2G

Thermo-Osmotic Soil Moisture Transfer Upon Freezing,
W75-01534 2C

SOIL PHYSICAL PROPERTIES
Methods for Analysis of Irrigated Soils.
W75-01239 2G

Electrical Parameters of Some Frost-Prone Soils,
W75-01595 2C

SOIL PROPERTIES
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

SOIL WATER MOVEMENT
On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

Thermo-Osmotic Soil Moisture Transfer Upon Freezing,
W75-01534 2C

SOLID WASTES
Waste from Wastepaper Utilization,
W75-01261 5B

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

SOLIDS
Strainer Device for Liquids,
W75-01637 5D

SOLVENT EXTRACTIONS
Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

SOUTH AFRICA
International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

SOUTH AFRICA (PRETORIA)
Determination of Groundwater Recharge with Tritium,
W75-01299 2G

SOUTH AFRICA (VAAL RIVER)
Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

SOUTH AMERICA
The Latin American Approach to the Law of the Sea,
W75-01346 6E

Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

SOUTH CAROLINA
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

SOUTHEAST US
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

SOUTHWEST US
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

Snowpack and Related Trends in Mountains of the Southwestern United States,
W75-01524 2C

SPAWNING
Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

SPECIATION
A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

SPECIES DIVERSITY
The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

SPECTROMETRY
The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

SPECTROPHOTOMETRY
Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

SPECTROSCOPY
Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

SPECTROSCOPY (ATOMIC ABSORPTION)
Determination of Mercury from Lake Sediments,
W75-01598 5A

SPILLWAYS
Flood Control in Reservoirs and Storage Pounds--A Discussion,
W75-01301 4A

SPONGICOLOUS ALGAE
Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

SPONGILLA LACUSTRIS
Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

SPORE TRAPS
Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

SPOROPHORE PRODUCTION
Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

SPOROPHORES
Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

SPORT FISH
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

SPRING
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

SPRINGS
Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

ST. FRANCIS RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

STABILITY
The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

STABLE ISOTOPES
Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

STANDARD METROPOLITAN STATISTICAL AREA
Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

STANFORD WATERSHED MODEL
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

STATE JURISDICTION
Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

STATISTICAL METHODS
Some Applications of Statistical Methods to Ground-Water Flow System Analysis,
W75-01211 2F

STEAM
Geothermal Resources.
W75-01342 4B

STEMPHYLIUM-BOTRYOSUM-F-SP-LYCOPERSI
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

STERILIZATION
Irradiator for Water Purification,
W75-01189 5D

STOCHASTIC PROCESSES
Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

Eutrophication: A Mathematical Model,
W75-01385 5C

Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

STORAGE
Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

STORAGE TANKS
Clear-Span Domes Cover Water Tanks.
W75-01639 5G

STORM DRAINS
Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

STORM RUNOFF
I-90 Lake Washington Circulation Study.
W75-01134 5G

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

STORM WATER
Screening Model for Storm Water Control,
W75-01110 5D

STRAINERS
Strainer Device for Liquids,
W75-01637 5D

STRATIGRAPHY
Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

STREAM FLOW
Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

STREAM GAGES
Conceptual Design of a Multipurpose Instrument for Winter Stream Metering,
W75-01587 7B

STREAM MORPHOLOGY
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

STREAMBEDS
Flow and Bed Topography in Channel Bends,
W75-01308 8B

STREAMFLOW
Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

STREAMFLOW FORECASTING
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

A New California Department of Water Resources Telemetry System,
W75-01552 7B

STREAMS
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

STRESS ANALYSIS
The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

STRIP MINE WASTES
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

STRIP MINES
Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

STRONTIUM
Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

STRUCTURAL STABILITY
The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

SUBLETHAL EFFECTS
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

SUBLIMATION
Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

SUBSIDENCE
Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

SUBSURFACE DRAINAGE
Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

SUGAR BEETS
Use of Phosphoric and Sulfuric Acids to Reduce Soil Crusting and Improve Emergence of Sugarbeet (Beta Vulgaris L.) Seedlings,
W75-01386 3F

SULFATES
Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

SULFITE LIQUORS
Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

SULFITE WASTES
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

SULFURIC ACID
Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

SUNFISHES
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

SUPERCOOLING
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

SURFACE-GROUNDWATER RELATIONSHIPS
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

SURFACE RUNOFF
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

SURFACE WATERS
The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

Water in the Methow River Basin, Washington,
W75-01181 4A

SURFACTANTS
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

SURVEYS
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

The I.H.D. World Glacier Inventory,
W75-01541 2C

Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

SUSPENDED SOLIDS
Waste from Wastepaper Utilization,
W75-01261 5B

Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

SUSPENSION
Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

SWAMPS
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

SWEDEN
Effects of Acidification of Swedish Lakes,
W75-01473 5C

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Objective, Organization and Extent of Program, (In Swedish),
W75-01599 5G

SYSTEM ANALYSIS
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

SYSTEMATICS
Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

SYSTEMS ANALYSIS
Use of Systems Approach in Water Resources Planning,
W75-01112 6A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

TANGELOS TREES
Measure of Water Stress in Citrus,
W75-01223 3F

TANK EVAPORATION
Survey of New Zealand Tank Evaporation,
W75-01307 2D

TANKS
Clarifying Tank for Effluents.
W75-01634 5D

TASMANIA
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

TASMANIA (LAKE PEDDER)
The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

TECHNOLOGY
Mechanical and Habitat Manipulation for Aquatic Plant Management,
W75-01481 5C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

TELEMETRY
Radiotelemetry of Hydrometerological Data,
W75-01214 7B

New Concepts in Snow Surveying to Meet Expanding Needs,
W75-01526 7B

A New California Department of Water Resources Telemetry System,
W75-01552 7B

Meteor Burst Communication,
W75-01593 7B

TEMPERATURE
Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

Hydrology of Warm Snowpacks and Their Effects Upon Water Delivery--Some New Concepts,
W75-01530 2C

Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

TENNESSEE
A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

TEXAS
Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

TEXTILES
Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

THAILAND
A Water Storage Method Based on Human Environment,
W75-01469 3B

THAILAND (PA MONG DAM)
The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

THAMES RIVER (ENGLAND)
Nitrogen: A Problem of Decreasing Dilution,
W75-01502 5B

THERMAL CAPACITY
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

THERMAL CONDUCTIVITY
Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

THERMAL POLLUTION
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

Warming of the World's Waters by Man,
W75-01432 5C

THERMAL POWERPLANTS
Warming of the World's Waters by Man,
W75-01432 5C

THERMAL PROPERTIES
An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

Geothermal Resources.
W75-01342 4B

THERMAL RADIATION
An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

THERMAL STRATIFICATION
Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

THERMAL WATER
Geothermal Resources.
W75-01342 4B

THERMOCLINE
An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

THERMOLUMINESCENT DOSIMETERS
Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

THOMAS HILL RESERVOIR (MO)
Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

TIDAL MARSHES
Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

TIME SERIES ANALYSIS
Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

TOMATOES
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

Influence of Restricted Water Supply on Blossom-End Rot and Ionic Composition of Tomatoes Grown in Nutrient Solution,
W75-01612 3F

TOPOGRAPHY
Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

TOTAL ORGANIC CARBON
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

TOXICITY
Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and its Prevention,
W75-01604 5C

TRACE ELEMENTS
Possibilities of the 'Carbon Rod' Technique for the Determination of Trace Elements in Water by Atomic Absorption,
W75-01619 5A

TRACE METALS
The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

TRACERS
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

Determination of Groundwater Recharge with Tritium,
W75-01299 2G

Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

TRACKING TECHNIQUES
I-90 Lake Washington Circulation Study.
W75-01134 5G

TRAINING
Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

A Curriculum Activities Guide to Water Pollution and Environmental Studies: Activities, Volume 1.
W75-01314 6B

International Cooperation in Developing Water Resources,
W75-01439 6E

World Meteorological Organization Activities in Central America,
W75-01449 6E

TRANSITION MATRICES
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

TRANSPIRATION
Different Sensitivity of Photosynthesis and Transpiration to Some Herbicides and Transpiration Inhibitors,
W75-01615 3F

Variability of Relationships Between Transpiration, Shoot and Root Metabolism, and Nutrient Uptake in Intake Plants,
W75-01616 2D

TREATIES
The Latin American Approach to the Law of the Sea,
W75-01346 6E

Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

TREATMENT FACILITIES
Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

TREES
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

TREMPEALEAU-BLACK RIVER BASIN (WISC)
Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

TRIBUTARIES
River Mileage Tabulations for the Colorado River Basin. Communities and Major Tributaries.
W75-01309 7C

TRICKLING
Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

TRICKLING FILTERS
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

TRITIUM
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

Determination of Groundwater Recharge with Tritium,
W75-01299 2G

TROPHIC LEVEL
The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

TROUT
Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

TUBIFEX TUBIFEX
On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

TUBIFICIDS
On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

TUCSON (ARIZ)
Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

TUNNELS
Bermuda Tunnels for Fresh Water,
W75-01464 4B

TURBULENCE
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

TWO-PHASE FLOWS
For a Modified Theory of Infiltration. 2nd Part How, (Pour une theorie modifiee de l' infiltration. 2 eme partie: Comment),
W75-01220 2G

TYRONZA RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

UNIQUENESS INDEX
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

UNIQUENESS RATIO
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

UNIT HYDROGRAPHS
Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

UNITED KINGDOM (ELY VALLEY WALES)
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

UNITED KINGDOM (NORTHUMBERLAND)
An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

UNITED NATIONS
Organizational Basis of International Co-Operation in Development of Water Resources and Quality of Human Environment,
W75-01440 6E

Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

UNITED STATES
Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

UNIVERSITIES
Desert Research Institute, Annual Report, 1970-1971.
W75-01202 9D

Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

UNSATURATED FLOW
Derivation of an Equation of Infiltration,
W75-01126 2G

Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

UNSTEADY DISPERSION
Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

UPPER CLARK FORK RIVER (MONT)
Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

URBAN DRAINAGE
Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

Storm Drainage System Design and New City Planning,
W75-01253 8A

URBAN HYDROLOGY
Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

URBAN RUNOFF
Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

URBANIZATION
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

USSR (KUBAN RIVER)
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

USSR (LAKE ILMEN)
Comparative Evaluation of Two Methods of Calculating Production Exemplified by the Zooplankton of Lake Ilmen, (In Russian),
W75-01394 5C

USSR (NORTHERN DONETS)
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

USSR (TSIMLYANSK RESERVOIR)
A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

UTAH
The Geologic Story of Canyonlands National Park,
W75-01163 6B

Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

UTILITY FUNCTIONS
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

VALLEY-FILL AQUIFERS
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

VARIABILITY
Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

Estimating True Basin Snowcover,
W75-01551 2C

VEGETATION
Vegetation of the Earth in Relation to Climate and Eco-Physiological Conditions,
W75-01116 2I

Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

VEGETATION CONVERSION
WAMIS--An Aid in Locating Information,
W75-01219 10A

VEGETATION EFFECTS
WAMIS--An Aid in Locating Information,
W75-01219 10A

Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

VENEZUELA
Some Chemical Aspects of the Humus of Underwater Sediments, (In Spanish),
W75-01603 2J

VERMONT
Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

Flood Hazards in Vermont (A Strategy for Abatement),
W75-01290 4A

Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

VERTICAL MIXING
A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

VINE CROPS
Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

VIRGINIA
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

VIRUSES
Blue-Green Algal Genetics: A New Methodology,
W75-01514 5C

VITAMIN B
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

VOLUMETRIC ANALYSIS
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

WABASH RIVER (IND)
The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

WARBURG RESPIROMETRY
A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

WARM WATER FISH
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

WARNING SYSTEMS
Radiotelemetry of Hydrometerological Data,
W75-01214 7B

WASHINGTON
Water in the Methow River Basin, Washington,
W75-01181 4A

Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

WASTE ASSIMILATIVE CAPACITY
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

WASTE DISPOSAL
Problems of Liquid Waste Disposal,
W75-01252 5D

Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

Disposing of Industrial Wastes: The Paper Industry (Smaltimento rifiuti industriali: Industria della carta),
W75-01379 5D

WASTE DUMPS
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

WASTE-LOAD ALLOCATION
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

WASTE PAPERS
Waste from Wastepaper Utilization,
W75-01261 5B

WASTE TREATMENT
Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Disposing of Industrial Wastes: The Paper Industry (Smaltimento rifiuti industriali: Industria della carta),
W75-01379 5D

WASTE WATER
Water and Waste Flow Measurement,
W75-01262 7B

WASTE WATER DISPOSAL
Land Application of Wastewater,
W75-01141 5D

WASTE WATER (POLLUTION)
The Delaware Valley Plan.
W75-01137 6D

Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Determination of Chromium in Water and Waste Water (Bestimmung des Chroms in Wasser und Abwasser),
W75-01641 5A

WASTE WATER TREATMENT
Appearance and stability of hydrolyzed Fe(C104)3 solutions,
W75-01102 5B

Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

Land Application of Wastewater,
W75-01141 5D

Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

Sewage Treatment Apparatus,
W75-01186 5D

Sewage Treatment Apparatus,
W75-01187 5D

Irradiator for Water Purification,
W75-01189 5D

Treatment and Use of Waste Effluent Streams,
W75-01190 5D

Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

Water Purification Means,
W75-01193 5D

Treatment for Waste Water or the Like,
W75-01194 5D

Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

Problems of Liquid Waste Disposal,
W75-01252 5D

Engineering Approach to a Secondary Treatment System,
W75-01266 5D

Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

Ozonation of a Kraft Mill Effluent,
W75-01279 5D

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

PE Pipe Used at Oxford Paper.
W75-01371 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Disposing of Industrial Wastes: The Paper Industry (Smaltimento rifiuti industriali: Industria della carta),
W75-01379 5D

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

Water Treatment Sludge Filtration Studies,
W75-01392 5D

Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

Aqua-Sans Sewage Treatment System,
W75-01471 5D

Compact Waste Water Pumping Systems with High Capacity (Kompakte Abwasserpumpwerke Grosser Leistung),
W75-01628 5D

Sewage and Effluent Treating System,
W75-01632 5D

Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

Strainer Device for Liquids,
W75-01637 5D

Examples of the Effective Use of Plastic Materials in a Municipal Water Supply and Waste Water Treatment Plant (Beispiele der effektiven Plastanwendung in einem VEB Wasserversorgund und Abwasserbehandlung),
W75-01638 5D

Filtering and Concentrating Means and Method,
W75-01650 5D

WASTEWATER TREATMENT

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Objective, Organization and Extent of Program, (In Swedish),
W75-01599 5G

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Surface Water Quality of Recipients, August-October, 1972, (In Swedish),
W75-01600 5G

WATER ALLOCATION (POLICY)

A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

WATER ANALYSIS

An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

WATER BALANCE

Water Needs of Florida Citrus,
W75-01222 3F

A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

A Water Balance Assessment of the New Zealand Rainfall,
W75-01305 2A

Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

WATER CHEMISTRY

The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

WATER CIRCULATION

I-90 Lake Washington Circulation Study.
W75-01134 5G

WATER CONSERVATION

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

WATER COOLING

Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

WATER DEMAND

Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

WATER DISTRICTS

Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

WATER EQUIVALENT
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

The Snow Moisture Integrator,
W75-01590 7B

WATER FLOW (PLANTS)
Frictional Potential Losses and Total Water Potential in Plants: A Re-Evaluation,
W75-01617 2I

WATER LAW
Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

WATER LEVELS
Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

Status Report on the Water Levels of the Great Lakes.
W75-01340 6E

Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

WATER-LOAD ALLOCATION
Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

WATER LOSS (PLANTS)
Frictional Potential Losses and Total Water Potential in Plants: A Re-Evaluation,
W75-01617 2I

WATER MANAGEMENT (APPLIED)
Screening Model for Storm Water Control,
W75-01110 5D

Water Management Problems,
W75-01434 6E

WATER POLICY
Indian National Water Plan and Grid,
W75-01458 6B

WATER POLLUTION
Screening Model for Storm Water Control,
W75-01110 5D

I-90 Lake Washington Circulation Study.
W75-01134 5G

Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

Problems of Liquid Waste Disposal,
W75-01252 5D

A Curriculum Activities Guide to Water Pollution and Environmental Studies: Activities, Volume 1.
W75-01314 6B

Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

A Citizen's Guide to Clean Water.
W75-01339 5G

The International Association on Water Pollution Research,
W75-01446 5G

Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

WATER POLLUTION CONTROL
Zones of Nitrification,
W75-01103 5B

The Delaware Valley Plan.
W75-01137 6D

Control of Combined Sewer Overflow Events,
W75-01138 5G

Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Effects of Wastewater Surcharges,
W75-01330 5G

Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

A Prognosis for a Lake,
W75-01506 5C

WATER POLLUTION CONTROL ACT
A Citizen's Guide to Clean Water.
W75-01339 5G

WATER POLLUTION EFFECTS
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

Isolates of Penicillium, Aspergillus, and Trichoderma Toxic to Aquatic Plants,
W75-01225 5C

Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

A Citizen's Guide to Clean Water.
W75-01339 5G

On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Coal Mining and its Effect on Water Quality,
W75-01435 5B

WATER POLLUTION INDEX
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

WATER POLLUTION SOURCES
Mercury in Waters of the Western United States,
W75-01166 5B

The Occurrence of Nitrate in Groundwater,
W75-01247 5B

Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

Coal Mining and its Effect on Water Quality,
W75-01435 5B

Some Water Resources Problems and Human Environment,
W75-01436 4A

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

WATER POLLUTION TREATMENT
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

WATER POTENTIAL (PLANTS)
Frictional Potential Losses and Total Water Potential in Plants: A Re-Evaluation,
W75-01617 2I

WATER PROPERTIES
Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

WATER PURIFICATION
Irradiator for Water Purification,
W75-01189 5D

Water Purification Means,
W75-01193 5D

Treatment for Waste Water or the Like,
W75-01194 5D

Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

WATER QUALITY
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

Freeway Runoff from the I-90 Corridor,
W75-01135 5C

Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

Quality of Public Water Supplies of New York, November 1970-April 1972.
W75-01170 5B

An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

A Study of Chemicals in Drinking Water from Selected Public Water Systems, New York State, October 1970 to March 1971.
W75-01182 5A

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

WATER QUALITY CONTROL
Groundwater Management and Salinity Control,
W75-01117 4B

Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

A Citizen's Guide to Clean Water.
W75-01339 5G

Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

Report of the Water Management Sector Group on Eutrophication Control.
W75-01476 5C

Clear-Span Domes Cover Water Tanks.
W75-01639 5G

Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

WATER QUALITY STANDARDS
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

WATER REQUIREMENTS
Water Needs of Florida Citrus,
W75-01222 3F

WATER RESOURCE DEVELOPMENT
Region 'P', Phase II Water Quality Management Plan.
W75-01145 5G

WATER RESOURCES
Use of Systems Approach in Water Resources Planning,
W75-01112 6A

The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

Water in the Methow River Basin, Washington,
W75-01181 4A

Remote Sensing and Snowpack Management,
W75-01294 2C

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in South-Central Minnesota.
W75-01389 6B

Proceedings of Public Workshop Conference on Water Resources Problems and Research Needs in Northwestern Minnesota.
W75-01390 6B

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Global Action for Man's Water Resources,
W75-01429 6F

Water and the Energy Crisis,
W75-01430 4A

WATER RESOURCES

Water Management Problems,
W75-01434 6E

Some Possibilities for International Development of the Ganges-Brahmaputra River Basins,
W75-01441 6B

Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

World Meteorological Organization Activities in Central America,
W75-01449 6E

Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

Floods as a Supplying Factor for Water Resources,
W75-01460 4A

Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

A Water Storage Method Based on Human Environment,
W75-01469 3B

WATER RESOURCES DEVELOPMENT

A Process for Federal Water Planning at the Field Level,
W75-01115 6A

Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Australian Representative Basins Programme--Progress 1973.
W75-01310 7C

Water for the Human Environment, Volume 1, Congress Papers.
W75-01428 6B

Some Water Resources Problems and Human Environment,
W75-01436 4A

Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

International Cooperation in Developing Water Resources,
W75-01439 6E

Organizational Basis of International Co-Operation in Development of Water Resources and Quality of Human Environment,
W75-01440 6E

Some Possibilities for International Development of the Ganges-Brahmaputra River Basins,
W75-01441 6B

Regional Systems and Hydraulic Grids,
W75-01443 6A

Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

Interbasin Transfer of Water,
W75-01452 4A

International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

Integrated Approach to Water Resources Development in Water Scarce Countries,
W75-01454 6B

Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

Ground Water Assessment and Development in Developing Countries,
W75-01457 4B

Indian National Water Plan and Grid,
W75-01458 6B

Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

Bermuda Tunnels for Fresh Water,
W75-01464 4B

The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

A Water Storage Method Based on Human Environment,
W75-01469 3B

Soil-Cement for Water Control Structures,
W75-01470 8F

WATER RESOURCES INSTITUTE

Desert Research Institute, Annual Report, 1970-1971.
W75-01202 9D

Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

WATER RESOURCES RESEARCH ACT

Desert Research Institute, Annual Report, 1970-1971.
W75-01202 9D

Ninth Annual Report, Program Activities, July 1, 1972-June 30, 1973.
W75-01209 9D

Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

WATER REUSE

Pollution: Panels and Trout (Pollution: Des panneaux et des truites).
W75-01280 5D

Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

WATER RIGHTS

Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

WATER SAMPLING

Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

WATER STORAGE

A Water Storage Method Based on Human Environment,
W75-01469 3B

WATER STRESS

Measure of Water Stress in Citrus,
W75-01223 3F

WATER SUPPLY

Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

The Delaware Valley Plan.
W75-01137 6D

Quality of Public Water Supplies of New York, November 1970-April 1972.
W75-01170 5B

A Study of Chemicals in Drinking Water from Selected Public Water Systems, New York State, October 1970 to March 1971.
W75-01182 5A

Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

Bermuda Tunnels for Fresh Water,
W75-01464 4B

A Water Storage Method Based on Human Environment,
W75-01469 3B

Investigation of the Optimal Life of Fixed Capital in Water Supply and Sewer Systems (Az Alloeszkozok Optimalis Elettartamanak Vizsgalata a Vizellatas es Csatornazas Teruleten),
W75-01630 8A

Examples of the Effective Use of Plastic Materials in a Municipal Water Supply and Waste Water Treatment Plant (Beispiele der effektiven Plastanwendung in einem VEB Wasserversorgund und Abwasserbehandlung),
W75-01638 5D

WATER SUPPLY DEVELOPMENT
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

Water and Wastewater--Summary of a Plan for Water-Sewer Development in the Lake-Porter Region, Indiana.
W75-01146 6B

Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

WATER TABLE
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

WATER TEMPERATURE
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

WATER TREATMENT
Water Still,
W75-01185 5F

Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

Problems of Liquid Waste Disposal,
W75-01252 5D

Water Treatment Sludge Filtration Studies,
W75-01392 5D

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

WATER USERS
Effects of Wastewater Surcharges,
W75-01330 5G

Water Management Problems,
W75-01434 6E

WATER UTILISATION
Urban Water Use in Australia,
W75-01254 6D

WATER WELLS
Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

WATER YIELD IMPROVEMENT
WAMIS--An Aid in Locating Information,
W75-01219 10A

Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

WATER YIELDS
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

WATERSHED MANAGEMENT
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

WATERSHEDS (BASINS)
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

WAVES
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

WEATHER MODIFICATION
Some Water Resources Problems and Human Environment,
W75-01436 4A

Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

WEIGHTING FUNCTION
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

WELLS
Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

WEST INDIES (ST. LUCIA)
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

WEST VIRGINIA
Effects of Wastewater Surcharges,
W75-01330 5G

WHEAT
Role of Physiological Plant Activity in Adaptive Increase in Drought Resistance: 1. Effect of Heat Regimes on Moistened Germinating Wheat Seeds, (In Russian),
W75-01150 3F

Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

WHITE RIVER (ARK)
Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

WHITE RIVER BASIN (ARK)
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

WILDLIFE
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

WILLIMANTIC/SHETUCKET RIVERS (CONN)
The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

WIND VELOCITY
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

WINTER
The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

WINTER SPORTS
Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

WINTERSPORTS
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

WISCONSIN
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

WISCONSIN

Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

WITHDRAWAL

Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

WOOD WASTES

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfall-sprodukter.),
W75-01278 5D

WYOMING

Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

YEASTS

How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfall-sprodukter.),
W75-01278 5D

Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

ZINC

Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

ZONATION

Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

ZONING

Global Action for Man's Water Resources,
W75-01429 6F

ZOOPLANKTON

Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Eutrophication: A Mathematical Model,
W75-01385 5C

Comparative Evaluation of Two Methods of Calculating Production Exemplified by the Zooplankton of Lake Ilmen, (In Russian),
W75-01394 5C

The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

AUTHOR INDEX

ACKLEY, S. F.
Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

AGALAROV, A. M.
The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

AHMAD, M. U.
Coal Mining and its Effect on Water Quality,
W75-01435 5B

AIRAN, L. D.
A Bargaining Approach for Programming Least-Cost Waste Treatment Levels Along a River,
W75-01407 5D

AKAMATSU, I.
Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

ALAVIAN, V.
Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

ALBERT, C. D.
Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

ALDRICH, L. C.
A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

ALGAZI, V. R.
An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

ALGER, G. R.
The Snow Moisture Integrator,
W75-01590 7B

ALLEN, C. R.
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

ALMER, B.
Effects of Acidification of Swedish Lakes,
W75-01473 5C

ALSBERG, D. A.
Drainage System,
W75-01188 8B

ALSBERG, G. R.
Drainage System,
W75-01188 8B

ANAS, R. E.
Heavy Metals in the Northern Fur Seal, Callorhinus Ursinus, and Harbor Seal, Phoca Vitulina Richardi,
W75-01425 5C

ANDERSON, D. M.
Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

ANGELL, C. A.
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

ARANBAEV, M. P.
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

ARBABI, M.
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

ARMENDARIZ BLAZQUEZ, J. L.
Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

ARMSTRONG, D. E.
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

ARMSTRONG, R. L.
Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

ASPOSTOL, S.
A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and its Prevention,
W75-01604 5C

ATCHISON, K. T.
Data for Border Irrigation Models,
W75-01120 3F

AULD, A. H.
Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

AULENBACH, D. B.
Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

AULL, G. H. JR.
Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

BABAEV, G. B.
Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

BADER, J. S.
Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

BAGGA, D. K.
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

BALHAR, L.
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

BALLANCE, W. C.
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

BARBER, R. T.
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

BARNES, G. W. JR.
A New California Department of Water Resources Telemetry System,
W75-01552 7B

BARNES, J. C.
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

BARNETT, B. S.
Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

BARTHOLIC, J. F.
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

Measure of Water Stress in Citrus,
W75-01223 3F

Water Needs of Florida Citrus,
W75-01222 3F

BARTON, M.
New Concepts in Snow Surveying to Meet Expanding Needs,
W75-01526 7B

BARTOS, L. R.
Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

BASHI, E.
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

BASS, J. C.
An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

BASSO, E.
World Meteorological Organization Activities in Central America,
W75-01449 6E

BAUER, A.
Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

BAUER, D. P.
Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

BAUMAN, H. D.
Ozonation of a Kraft Mill Effluent,
W75-01279 5D

BEARDSLEY, R. C.
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

BEATTIE, J. H.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

BEDROSIAN, A. J.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

BELL, W. D.
Measure of Water Stress in Citrus,
W75-01223 3F

BELLA, D. A.
A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

BENNETT, W. O.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

BERGER, B. B.
The International Association on Water Pollution Research,
W75-01446 5G

BERMAN, T.
Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

BERRY, J. E.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

BEZGINA, S. I.
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

BHARATHAN, K.
Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

BIGGAR, J. W.
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

BIGGS, A. W.
Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

BILELLO, M. A.
Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

BINGHAM, D. L.
Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

BINGHAM, S. W.
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

BISHOP, A. A.
Water Management Problems,
W75-01434 6E

BISSELL, V. C.
Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

BJORKLUND, L. J.
Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

BLACK, B. A.
Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

BLAZKA, P.
Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

BLOSSER, R. O.
Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

BLYTH, K.
Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

BOERSMA, L.
Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

BOGDAN, K.
Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

BONHAM, A. J.
Storm Drainage System Design and New City Planning,
W75-01253 8A

BORMAN, R. G.
Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

BORRUSO, D.
Disposing of Industrial Wastes: The Paper Industry (Smaltimento rifiuti industriali: Industria della carta),
W75-01379 5D

BOWLEY, C. J.
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

BOYD, C. E.
Amino Acid Composition of Freshwater Algae,
W75-01238 5C

BOYLEN, C. W.
Primary Productivity of Rooted Macrophytes in the Littoral Zone of Lake George,
W75-01490 5C

BRADY, D. K.
Warming of the World's Waters by Man,
W75-01432 5C

BRAMMER, J. D.
Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

BRANCH, J.
Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

BRAUER, G. A.
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

BRENNER, R. N.
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

BREWER, R. E.
Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

BRIDGES, D. W.
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

BRILTZ, R. P.
Sewage and Effluent Treating System,
W75-01632 5D

BROOKSBANK, P.
Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

BROWMAN, L. G.
Channels in Ice,
W75-01543 2C

BROWN, A. J.
Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

Long-Range Goal and Information Needs of the Coordinated Snow Survey Program in California,
W75-01527 7C

BRYAN, M. L.
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

BRYANT, C. T.
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

BRYANT, G.
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

BRYSON, D. R.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

BUCHANAN, D. W.
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

BUCHANAN, J. B.
An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

BURGE, D. L.
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

BURGY, R. H.
An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

BURSON, Z. G.
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

BUTTERWORTH, A. B.
Littoral Flow Trap or Basin,
W75-01198 8B

BUTTROSE, M. S.
Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

BUTZ, I.
Drifting Behavior of Ephemerella Ignita (Ephemeroptera), (In German),
W75-01636 2I

CAIRNS, J. JR.
The Effect of an Influx of New Species on the Diversity of Protozoan Communities,
W75-01486 5C

CAMPBELL, C. J.
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

CAMPBELL, K. J.
Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

CAMPBELL, W. J.
Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

CARLSON, R.
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

CEDENO-F, G.
Some Chemical Aspects of the Humus of Underwater Sediments, (In Spanish),
W75-01603 2J

CESAROTTI, D. J.
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

CHADWICK, D. G.
Measurement of Soil Moisture by Use of the Latent Heat of Vaporization,
W75-01334 2G

CHAHAL, K. S.
Microbial Activities During Sewage Treatment in Lagoons I. Changes in Aerobic and Anaerobic Bacteria, Actinomycetes, Fungi, II. Changes in Different Types of Fungi, III. Changes in BOD and Dehydrogenase Activity,
W75-01318 5B

CHAND, K.
Some Water Resources Problems and Human Environment,
W75-01436 4A

CHANG, D. T.
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

CHANG, T. C.
Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

CHARUDATTAN, R.
Isolates of Penicillium, Aspergillus, and Trichoderma Toxic to Aquatic Plants,
W75-01225 5C

CHATURVEDI, M. C.
Indian National Water Plan and Grid,
W75-01458 6B

CHAU, A. S. Y.
Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

CHEEK, R. P.
Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

CHEN, H. T.
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

CHESTNUT, H.
The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

CHEW, K. K.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

CHOW, V. T.
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

Multireservoir Optimization Model,
W75-01226 4A

CHUDYBA, H.
Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

CHURZINA, N. N.
Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

CLARK, P. J.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

CLAYFIELD, E. J.
Treatment of Aqueous Suspensions of Organic Waste Materials,
W75-01184 5D

CLESCERI, N. L.
Nutrient Inputs to a Lake and Their Effects Upon Water Quality,
W75-01491 5C

Sources of Nitrogen and Phosphorus in the Lake George Drainage Basin: A Double Lake,
W75-01235 5B

CLISBY, R. L.
The Occurrence of Nitrate in Groundwater,
W75-01247 5B

COBLE, R. W.
The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

COHEN, M.
Measure of Water Stress in Citrus,
W75-01223 3F

COHEN, Y.
Epidemiological Patterns of Phytophthora Infestans Under Semi-Arid Conditions,
W75-01610 3F

COLBECK, S. C.
On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

COLVILLE, J. S.
Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

COMMINGS, A. B.
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

CONNER, J. R.
Water Needs of Florida Citrus,
W75-01222 3F

CONWAY, R. A.
Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

COOLEY, R. L.
Some Applications of Statistical Methods to Ground-Water Flow System Analysis,
W75-01211 2F

CORDERY, I.
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

CORDOVA, R. M.
Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

CORMACK, J. F.
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

COSBY, B. J.
Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

COSNER, O. J.
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

COULTER, J. D.
A Water Balance Assessment of the New Zealand Rainfall,
W75-01305 2A

COWELL, B. C.
Life History of the Taillight Shiner, Notropis Maculatus in Central Florida,
W75-01602 2I

COWGILL, U. M.
Biogeochemical Cycles for the Chemical Elements in Nymphaea Odorata Ait. and the Aphid Rhopalosiphym Nymphaeae (L.) Living in Linsley Pond,
W75-01402 2H

CRAIG, W. K.
Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

CRAVENS, P. E.
Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

CROOK, A. G.
The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

CROWDER, W. K.
Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

CUMMINGS, R. G.
Groundwater Management and Salinity Control,
W75-01117 4B

CUMMINS, K. W.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

CURL, H. C. JR.
A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

DADYEVA, N.
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

DAGUE, R. R.
Planning for Water Resource Management,
W75-01456 6B

DALSEG, R.
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

DASS, P.
Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

DAVIS, A. L.
An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

DAVIS, J. C.
Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

DAVIS, P. L.
Planning for Water Resource Management,
W75-01456 6B

DAVYDOV, O. L.
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

DELLEUR, J. W.
Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

DEUTSCH, M.
Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

DIAZ, A. M.
Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

DICKERSON, J. A.
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

DICKSON, W.
Effects of Acidification of Swedish Lakes,
W75-01473 5C

DITTON, R. B.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

DORCEY, A. H. J.
Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

DOUGAN, W. K.
The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

DOXIADIS, C. A.
Global Action for Man's Water Resources,
W75-01429 6F

DOYLE, R. W.
Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

DRAEGER, W. C.
Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

DROST, W.
Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

DYCK, G. E.
Estimating True Basin Snowcover,
W75-01551 2C

DYE, M. H.
Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

EBERLE, D. O.
Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

EDELMAN, L.
Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

EDELSTEIN, M.
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

EDWARDS, R. A.
Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

EDWARDS, S. J.
The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

EHRLICH, N. A.
Ice and Icebreakers,
W75-01544 2C

EICHMANN, M. V.
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

EK, M.
How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

EKSTROM, C.
Effects of Acidification of Swedish Lakes,
W75-01473 5C

ELLIS, F. E.
Water and the Energy Crisis,
W75-01430 4A

ELLISON, C. V.
Irradiator for Water Purification,
W75-01189 5D

ELZINGA, J.
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

ENGELUND, F.
Flow and Bed Topography in Channel Bends,
W75-01308 8B

EPPLEY, R. W.
The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

ERH, K. T.
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

ERICKSEN, G. E.
Geology of Salars in Northern Chile,
W75-01351 2H

ERIKSSON, K.-E.
How Realistic is Fodder Yeast Production from Wood Industry Waste Products. (Hur realisera foderjasttillverkning po skogsindustriella avfallsprodukter.),
W75-01278 5D

ERNAU, M. C.
Microelectrodes Suitable for Use in Cells with High Hydrostatic Pressure,
W75-01596 7B

EUSTACE, I. J.
Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

FANGMEIER, D. D.
Data for Border Irrigation Models,
W75-01120 3F

FARRIS, G.
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

FARRIS, G. D.
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

FAVRET, U.
Apparatus for Recovering Oil Substances from the Surface of a Body of Water,
W75-01195 5G

FENTON, T. E.
Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

FERGUSON, H. L.
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

FETTER, C. W. JR.
Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

FIELD, R.
Design of a Combined Sewer Overflow Regulator Concentrator,
W75-01631 5D

FINENKO, Z. Z.
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

FINKELSTEIN, J.
Survey of New Zealand Tank Evaporation,
W75-01307 2D

FLICK, R. S.
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

FLINT, J. J.
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

FONKEN, D. W.
Data for Border Irrigation Models,
W75-01120 3F

FORDHAM, J. W.
Some Applications of Statistical Methods to Ground-Water Flow System Analysis,
W75-01211 2F

FORSBERG, C.
Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Objective, Organization and Extent of Program, (In Swedish),
W75-01599 5G

Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Surface Water Quality of Recipients, August-October, 1972, (In Swedish),
W75-01600 5G

FOX, I. K.
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

FOX, T.
A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

FRANK, D.
Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

FRANKEL, S. L.
Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

FREDRICKSON, E. E.
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

FRIEDMAN, I.
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

FRIEDMAN, J. H.
Eutrophication: A Mathematical Model,
W75-01385 5C

FRIES, H. E.
Treatment for Waste Water or the Like,
W75-01194 5D

FRITZSCHE, A. E.
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

FROMM, P. O.
Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

FUERST, R. L.
The Latin American Approach to the Law of the Sea,
W75-01346 6E

FULLERTON, R. W.
Aqua-Sans Sewage Treatment System,
W75-01471 5D

GAGE, J.
Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

GAIPOVA, A.
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

GALEY, M. E.
The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration,
W75-01349 6E

GANF, G. G.
Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

GARDNER, N. R.
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

GARRISON, C. B.
A Case Study of the Local Economic Impact of Reservoir Recreation,
W75-01106 6B

GASANOV, M. V.
Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

GEDNEY, R. T.
Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

GERBER, J. F.
Water Needs of Florida Citrus,
W75-01222 3F

GJESSING, E. T.
Chemical Composition of an Antarctic Snow Profile,
W75-01597 2C

GJESSING, Y. T.
Chemical Composition of an Antarctic Snow Profile,
W75-01597 2C

GLASS, G. E.
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

GLOERSEN, P.
Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

GOIS, C. Q.
International Cooperation in Cunene River Project Environmental Aspects,
W75-01448 6E

GOLDING, D. L.
A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

GORIN, P. A. J.
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

GOULD, B. W.
Persistence of High Daily Demands in Australian Water Supply Systems,
W75-01246 6D

Problems of Liquid Waste Disposal,
W75-01252 5D

GOULDEN, P. D.
Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

GOVE, G.
Survey of Pulp and Paper Industry Environmental Protection Expenditures and Operating Costs -- 1973,
W75-01380 5D

GOVE, G. W.
Waste from Wastepaper Utilization,
W75-01261 5B

GRANADE, J. W.
Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

GRANT, L. O.
Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

GRASTY, R. L.
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

GRAVES, G.
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

GRAY, D. M.
Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

GRENNEY, W. J.
A Theoretical Approach to Interspecific Competition in Phytoplankton Communities,
W75-01114 2I

GRISCHKOWSKY, R. S.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

GRUMMITT, W. E.
Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

GUNDOVA, E.
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

GUTENTAG, E. D.
Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

HAFLEY, W. L.
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

HAKANSON, L.
Determination of Mercury from Lake Sediments,
W75-01598 5A

HALMOVA, T.
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill

(Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

HANKE, S. H.
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

HANSEN, D. J.
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

HARDCASTLE, K.
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

HARLEMAN, D. R. F.
Surface Heat Loss From Cooling Ponds,
W75-01296 1A

HARLYENKA, S. U.
Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

HARRIS, R. J.
Automated Fluid Injector,
W75-01625 7B

HART, D. L. JR.
Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

HARTMENN, L.
The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

HARVES, M. T.
RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

HAUTH, L. D.
Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

HAWKINS, F. C.
Water Treatment Sludge Filtration Studies,
W75-01392 5D

HEIGHWAY, J. E.
Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

HELMINEN, S. K. J.
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

HENDRICKSON, D. W.
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

HENGEVELD, H. G.
Remote Sensing Applications in Canadian Ice Reconnaissance,
W75-01570 7B

HEWITT, J. P.
A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

HIBLER, W. D. III
Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

HIEMSTRA, L. A. V.
Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

HIKICHI, Y.
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

HILDENHEIMO, H.
Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

HILL, H. R.
Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

HILLS, R. C.
East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

HINRICH, H.
Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorblidliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

HISS, W. L.
Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

HOBBS, E. H.
Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

HODGKISS, I. J.
Studies on Plover Cove Reservoir, Hong Kong: Composition and Distribution of the Phytoplankton and its Relationship to Environmental Factors,
W75-01477 5C

HOERMANN, W. D.
Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

HOGLUND, B.
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

HOI, I.
A Prognosis for a Lake,
W75-01506 5C

HOLY, M.
Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

HOLYNSKA, B.
The Use of Chelating Ion Exchange in Conjunction with Radioisotope X-Ray Spectrometry for Determination of Trace Amounts of Metals in Water,
W75-01644 5A

HOOD, C. F.
Radiotelemetry of Hydrometerological Data,
W75-01214 7B

HORMBECK, J. W.
The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

HORNBERGER, G. M.
Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

HORNING, H. M.
Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

HORNSTROM, E.
Effects of Acidification of Swedish Lakes,
W75-01473 5C

HORTON, D. B.
A Study to Predict the Effects of Thermal Additions in the Bay River and Neuse River Area of North Carolina,
W75-01208 5C

HORTON, J. S.
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

HSU, P. H.
Appearance and stability of hydrolyzed Fe(C104)3 solutions,
W75-01102 5B

HUGGINS, L. F.
Radiotelemetry of Hydrometerological Data,
W75-01214 7B

HUKUO, K-I.
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

HUNDING, C.
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

HUNT, C. F.
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

HUNTER, J. V.
A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

Zones of Nitrification,
W75-01103 5B

HUSSEY, B. F.
The Stability of Earth and Rockfill Dams - Analysis by a Modified Method of Slices,
W75-01255 8D

IGNATEV, L. A.
Role of Physiological Plant Activity in Adaptive Increase in Drought Resistance: 1. Effect of Heat Regimes on Moistened Germinating Wheat Seeds, (In Russian),
W75-01150 3F

IMBODEN, D. M.
Phosphorus Model of Lake Eutrophication,
W75-01496 5C

INSHAKOV, M. D.
Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

ISHIO, S.
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

ISTVAN, K.
Stochastic Hydrological System Models (Stochastikus hidrologiai rendszer-modellek),
W75-01645 2A

ITO, T.
On the Pollution and Benthic Fauna of Shojin-Gawa, A Small Stream, in Sapporo, (In Japanese),
W75-01414 5C

JACOBSEN, O. S.
A Prognosis for a Lake,
W75-01506 5C

JAGGI, H.
Compact Waste Water Pumping Systems with High Capacity (Kompakte Abwasserpumpwerke Grosser Leistung),
W75-01628 5D

JAKUBEK, P.
Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

JAWED, M.
Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

JENNE, E. A.
Mercury in Waters of the Western United States,
W75-01166 5B

JENNINGS, M. E.
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

JERMAR, M.
Integrated Approach to Water Resources Development in Water Scarce Countries,
W75-01454 6B

JIRBERG, R. J.
Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

JONES, E. B.
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

JORGENSEN, S. E.
A Prognosis for a Lake,
W75-01506 5C

JUMIKIS, A. R.
Dielectric Constants in the Management of Freezing Systems,
W75-01594 2C

Electrical Parameters of Some Frost-Prone Soils,
W75-01595 2C

Thermo-Osmotic Soil Moisture Transfer Upon Freezing,
W75-01534 2C

JURGENSEN, M. F.
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

JURINAK, J. J.
The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

KAHANOVITCH, Y.
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

KALINA, G. P.
Quantitative Method for Enumerating Salmonellae in Surface Waters, (In Russian),
W75-01622 5A

KALIYAMURTHY, M.
Preliminary Studies on the Primary Production and its Relation to Fisheries of the Pulicat Lake,
W75-01105 5C

KALLY, E.
Extension of Israel's National Water System as a Function of Artificial Rainfall Prospects,
W75-01297 2A

KAMB, W. B.
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

KAMISHIMA, H.
Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

KANE, D.
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

KARDOS, L. T.
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

KARPEN, J.
Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

KATZER, J. R.
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

KAWERT, K. G. K.
Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

KAZIYEV, B. M.
Drain Construction Under High Groundwater Level Conditions (O Stroitel 'Stve Drenazha v Usloviyakh Vysokogo Uronnya Gruntovykh Vod),
W75-01629 8A

K"LLER, E. A.
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

KELLY, M. G.
Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

KELLY, R. P.
International Interbasin Transfer of Water--The NAWAPA Project,
W75-01453 4A

KENGERLI, A. D.
The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

KENOV, A. V.
Generalization, Typification, and Kinetic Analysis of the Biochemical Oxygen Demand Curves Based on BOD-Experiments (Obobshcheniye, titizatsiya i kineticheskiy analiz krivykh potrebleniya kisloroda po dannym BPK-opytov),
W75-01647 5A

KEPINSKI, A.
Organizational Basis of International Co-Operation in Development of Water Resources and Quality of Human Environment,
W75-01440 6E

KEYS, J. W. III
Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

KHABAKHBASHEV, Y. M.
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

KHAN, M. Y.
Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

KHANJI, J.
Derivation of an Equation of Infiltration,
W75-01126 2G

KIEKENS, L.
Possibilities of the 'Carbon Rod' Technique for the Determination of Trace Elements in Water by Atomic Absorption,
W75-01619 5A

KILLBURN, C.
Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

KING, R. A.
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

KIRSHEN, P. H.
Screening Model for Storm Water Control,
W75-01110 5D

KISILENKO, I. V.
Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

KITE, G. W.
Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

KLEIN, J. M.
Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

KLUG, J. J.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

KLUGE, M.
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

KNIGHT, J. H.
On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

KNOX, R. F.
Alteration of Lipid Content of Tissues and Gonosomatic Indices of White Crappie by Thermal Additions in Thomas Hill Reservoir, Missouri,
W75-01328 5C

KOBAYASHI, T.
Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

KOEHLER, D.
Examples of the Effective Use of Plastic Materials in a Municipal Water Supply and Waste Water Treatment Plant (Beispiele der effektiven Plastanwendung in einem VEB Wasserversorgund und Abwasserbehandlung),
W75-01638 5D

KOERNER, R. M.
Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

KOLKA, J. W.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

KONDO, T.
Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

KORENMAN, YA. I.
Extraction of Guaiacol from Aqueous Solutions (Ekstraktsiya gvayakola iz vodnykh rastvorov),
W75-01286 5D

KOWALCZEWSKI, A.
Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

KRAUS, M. P.
Blue-Green Algal Genetics: A New Methodology,
W75-01514 5C

KREZDORN, A. H.
Water Needs of Florida Citrus,
W75-01222 3F

KROGMAN, K. K.
Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

KROUSE, H. R.
Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

KRUPATKINA-AKININA, D. K.
Effect of Inorganic Phosphorous on the Growth Rate of Diatoms,
W75-01424 5C

KULARATNAM, K.
Some Techniques Adaptable for Application in Hydrogeological Investigations in Ceylon,
W75-01451 7B

KURIYAGAWA, F.
Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

LACHAPELLE, E. R.
A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

LAHAV, N.
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

LANCASTER, J. L. JR.
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

LANGE, O. L.
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

LANGHAM, E. J.
The Occurrence and Movement of Liquid Water in the Snowpack,
W75-01529 2C

LARSON, L. W.
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

LASZLO, M.
Investigation of the Optimal Life of Fixed Capital in Water Supply and Sewer Systems (Az Alloeszkozok Optimalis Elettartamanak Vizsgalata a Vizellatas es Csatornazas Teruleten),
W75-01630 8A

LATHAM, A. J.
Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

LAUER, D. T.
Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

LAURENSON, E. M.
Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

LAURENT, M.
Experimental Study of Ammonification in Aquatic Environments (In French),
W75-01132 5B

LEADER, R. E.
Meteor Burst Communication,
W75-01593 7B

LEASURE, R. A.
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

LEBEDEVA, L. A.
Phosphorus Compounds in Corn Tissues Under Unfavorable Conditions of Moistening, (In Russian),
W75-01151 3F

LEBLANC, H. P.
Strainer Device for Liquids,
W75-01637 5D

LECEWICZ, W.
The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

LEE, C. C.
Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

LEE, C.-S.
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

LEE, E. S.
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

LEE, G.
A National Policy for Phosphate Control in the Environment,
W75-01495 5C

LEISER, C. P.
Control of Combined Sewer Overflow Events,
W75-01138 5G

LEMM, C. A.
Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

LEVDIK, I. YU.
Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

LIBNYAKOVA, YU. F.
The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

LICHTBLAU, L. R.
Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

LIKENS, G. E.
The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

LILLARD, J. H.
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

LIMPERT, F. A.
Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

LIN, C. Y.
Isolates of Penicillium, Aspergillus, and Trichoderma Toxic to Aquatic Plants,
W75-01225 5C

LIN, Y-S.
Sewage Treatment Apparatus,
W75-01187 5D

LINDSTROM, F. T.
Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

LINLOR, W. I.
Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

Remote Sensing and Snowpack Management,
W75-01294 2C

LIPPMAN, M. J.
Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

LITTLE, B. M.
Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

LIU, Y-M.
Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

LOHMAN, S. W.
The Geologic Story of Canyonlands National Park,
W75-01163 6B

LOIJENS, H. S.
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

LOPEZ, M. E.
Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

LOUGEAY, R.
Detection of Buried Glacial and Ground Ice with Thermal Infrared Remote Sensing,
W75-01568 7B

LOW, J. B.
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

LUBEROFF, B. J.
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

LUOMA, H.
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

LUR'E, YU. YU.
Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

LUTZ, L. R.
Ozonation of a Kraft Mill Effluent,
W75-01279 5D

LYFORD, F. P.
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

LYMAN, J.
Annual Report July 1971 Through December 1972,
W75-01348 6B

LYNN, R. I.
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

MACAN, T. T.
Freshwater Ecology,
W75-01475 5C

MACDONALD, D. G.
Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

MACFARLANE, J. A.
Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

MACHNO, P.
Freeway Runoff from the I-90 Corridor,
W75-01135 5C

MACK, D. A.
Instrumentation for Water Quality Monitoring,
W75-01620 5A

MACLEOD, W. D.
Instrumentation for Water Quality Monitoring,
W75-01620 5A

MAGNUSON, J. J.
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

MAH, R. S. H.
Pipeline Network Calculations Using Sparse Computation Techniques,
W75-01626 8A

MAIDANOVICH, M. V.
Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

MAIDMENT, D.
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

MAIDMENT, D. R.
Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

MALLORY, T. W.
Control of Combined Sewer Overflow Events,
W75-01138 5G

MAMEDOV, R. G.
Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

MANAHAN, S. E.
Chemistry,
W75-01230 5A

MANOHAR-MAHARAJ, V.
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

MANSFIELD, W. W.
The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

MANSUE, L. J.
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

MAR, B. W.
Problems Encountered in Multidisciplinary Resources and Environmental Simulation Models Development,
W75-01500 6A

MARK, H.
Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

MARKHAM, W. E.
Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

MARKS, D. H.
Screening Model for Storm Water Control,
W75-01110 5D

MARSDEN, J. R.
An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

Mass Balance and Economic Models,
W75-01388 6A

MARTENS, D. W.
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

MARTIN, R.
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

MATSUMOTO, S.
Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

MATTHEWS, E.
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

MATULEWICH, V. A.
Zones of Nitrification,
W75-01103 5B

MCANDREW, D. W.
Snow Load Analysis and Recreational Uses of Snow Data,
W75-01523 2C

MCCAIN, J. F.
Progress Report on Flood-Frequency Synthesis for Small Streams in Alabama,
W75-01350 2E

MCCLAIN, E. P.
Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

MCCOY, R. A.
Littoral Flow Trap or Basin,
W75-01198 8B

MCFARLAND, J. W.
Groundwater Management and Salinity Control,
W75-01117 4B

MCGREEVY, L. J.
Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

MCKEOWN, J. J.
Waste from Wastepaper Utilization,
W75-01261 5B

MCKIM, H. L.
Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

MCLAY, C. L.
Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

MCMAHON, T. A.
Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

Urban Water Use in Australia,
W75-01254 6D

MCMILLAN, H.
The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

MCNAUGHT, D. C.
Studies of Size Selective Feeding by Zooplankton Designed for Implementation of Process Modelling,
W75-01507 5C

MEIER, M. F.
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

Ice Sheets and Glaciers,
W75-01167 2C

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

MEIMAN, J. R.
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

MEIN, R. G.
Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

MEISCH, M. V.
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

MEJIA, J. M.
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

MEL'TSER, F. R.
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

MELHORN, W. N.
Landscape Aesthetics Numerically Determined: Applications to Highway Corridor Selection,
W75-01227 6B

MELNICK, J. L.
Water Purification Means,
W75-01193 5D

MELVIN, R. L.
Hydrogeology of Southeastern Connecticut,
W75-01165 7C

MEURMAN, J. H.
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

MEZHERA, O. V.
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

MIDDLEBROOKS, E. J.
A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

MILBRINK, G.
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

MILLER, D.
The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

MILLER, L.
The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

MILLER, U.
Effects of Acidification of Swedish Lakes,
W75-01473 5C

MIROSHNICHENKO, M. P.
A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

MISRA, P. K.
Optimal Weighting Function in Water Quality Modeling,
W75-01111 5B

MOCK, S. J.
Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

MONHEIMER, R. H.
Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

MONTGOMERY, A. H. JR.
Effects of Wastewater Surcharges,
W75-01330 5G

MONZIE, P.
Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

MOORE, C. V.
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

MOORE, G. K.
Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

MOORE, R. K.
Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

MOREL-SEYTOUX, H. J.
Derivation of an Equation of Infiltration,
W75-01126 2G

For a Modified Theory of Infiltration. 2nd Part How, (Pour une theorie modifiee de l' infiltration. 2 eme partie: Comment),
W75-01220 2G

Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

MOWER, R. W.
Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

MUELLER, J. C.
Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

MUELLER, M. J.
Flood Hazards in Vermont (A Strategy for Abatement),
W75-01290 4A

MURAOKA, K.
Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

MURATORE, E.
Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

MURPHY, T. J.
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

MUSAMUKHAMEDOV, S. R.
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

MUZZARELLI, R. A. A.
The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

NACE, R. L.
Development of Hydrology in North America,
W75-01158 2A

The Hydrological Cycle--Historical Evolution of the Concept,
W75-01157 2A

NAGPAL, N. K.
Air Entrapment as a Possible Source of Error in the Use of a Cylindrical Heat Probe,
W75-01232 2G

NAKAGAWA, H.
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

NAKATSUJI, K.
Numerical Analysis on Unsteady Dispersion in River,
W75-01646 5B

NARYMSKAYA, R. A.
Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

NASSAR, E. G.
Water in the Methow River Basin, Washington,
W75-01181 4A

NEILL, W. H.
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

NELSON, D. W.
Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

NG, K. S.
Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

NGUYEN, T. G.
Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

NICHOLS, S. A.
Mechanical and Habitat Manipulation for Aquatic Plant Management,
W75-01481 5C

NIELSEN, D. R.
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

NIEWOLAK, S.
Production of Bacterial Biomass in the Water of the Ilawa Lakes,
W75-01488 5C

NIKITIN, YA. V.
Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

NIKOLAEVA, Z. V.
Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

NIYAZOVA, M. M.
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

NORTH, G. W.
Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

NOVIKOVA, K. F.
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

NYDAHL, J.
Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

O'NEILL, A. D. J.
Application of the Energy Budget for Predicting Snowmelt Runoff,
W75-01533 2C

O'SHAUGHNESSY, J. C.
Evaluation of Criteria for Determining Limiting Nutrients in surface Waters,
W75-01332 5A

OKUDA, T.
Some Chemical Aspects of the Humus of Underwater Sediments, (In Spanish),
W75-01603 2J

OKUZAWA, A.
Practical Analysis of Cyanide Ion in Industrial Waste Water, (In Japanese),
W75-01621 5A

OLDFATHER, C. L.
Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

OLSON, K. R.
Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

OMMANNEY, C. S. L.
The I.H.D. World Glacier Inventory,
W75-01541 2C

ORANGE, A. S.
Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

ORME, L. E.
Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

ORTOLANO, L.
A Process for Federal Water Planning at the Field Level,
W75-01115 6A

OWENS, L. B.
Relationship of Various Indices of Water Quality to Denitrification in Surface Waters,
W75-01404 5B

PAINTER, R. B.
Analysis of Snow Distribution Using Terrestrial Photogrammetry,
W75-01586 7B

PALTI, J.
Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

PANCHENKO, S. YE.
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

PARASHAR, S. K.
Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

PARKER, B. L.
Effects of Chronic Oil Contamination on Aquatic Dipterans: A State of the Art Report,
W75-01336 5C

PARKER, M.
Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

PATTON, J. T.
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

PEARCE, B. R.
Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

PEARSON, G. L.
Snowpack and Related Trends in Mountains of the Southwestern United States,
W75-01524 2C

PECAN, E. V.
Flax Pond: An Estuarine Marsh,
W75-01513 5C

PECK, E. L.
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

Measurement of Snow at a Remote Site: Natural Radioactivity Technique,
W75-01579 7B

PELL, K.
Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

PERKINS, P. C.
Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

PETERSON, R. C.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

PETTY, L. L.
Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

PHILIP, J. R.
On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

PHILLIPS, O. M.
The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

PHILLIPS, S. L.
Instrumentation for Water Quality Monitoring,
W75-01620 5A

PHILP, D. M.
Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

PHUNG, H. T.
Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

PIERCE, S. T.
The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

PILGRIM, D. H.
A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

PILKINGTON, N. H.
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

PILSTROM, L.
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

PINGRY, D.
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

PINGRY, D. E.
An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

PINGRY, D. R.
Mass Balance and Economic Models,
W75-01388 6A

PINKAYAN, S.
A Water Storage Method Based on Human Environment,
W75-01469 3B

PODCHERNYAEV, I. YA.
Magnetic Treatment of Aqueous Suspensions (Magnitnaya obrabotka vodnykh suspenii),
W75-01277 5D

POLAND, J. F.
Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

POLLINGHER, U.
Annual and Seasonal Variations of Phytoplankton, Chlorophyll, and Photosynthesis in Lake Kinneret,
W75-01482 5C

Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

POORE, R. V.
Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

POPKIN, B. P.
Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

POPOVA, M. P.
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

PORCELLA, D. B.
A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

POST, G.
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

POULIN, A. O.
Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

POWERS, O. L.
Water Still,
W75-01185 5F

PRANTL, F. A.
Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

PREJS, K.
Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

PRICE, K. S.
Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

PRISTOOP, S. M.
Oil and Hazardous Substance Pollution Control on the Open Sea,
W75-01468 5G

PROKHOROV, V. M.
Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

PROKOPENKO, V. A.
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

PROSKURINA, YE. S.
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

PUTTER, J.
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

QUINN, F. H.
Ice Information Collection, Dissemination and Uses on the Great Lakes,
W75-01556 7C

RAFFELSON, C. N.
Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

RAINS, B. A.
Water Quality Monitoring on the Mississippi River has Its Pitfalls,
W75-01139 5A

RAMSEIER, R. O.
Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

RAMSTEINER, K.
Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

RAMUS, J.
Seaweed Invasion,
W75-01492 5C

RANTA, H.
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

RAO, R. A.
Instantaneous Unit Hydrographs, Peak Discharges and Time Lags in Urban Basins,
W75-01124 4C

RAQUET, C. A.
Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

REAY, P. F.
A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

RECHARD, P. A.
Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

REED, J. E.
Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

REINKING, R. F.
Cloud Droplet Accretion on Snow Crystals,
W75-01540 2B

REITZ, H. J.
Water Needs of Florida Citrus,
W75-01222 3F

REVELLE, C.
The Oxygen Sag Equation: New Properties and a Linear Equation for the Critical Deficit,
W75-01118 5A

REYNOLDS, J. H.
A Continuous Flow Kinetic Model to Predict the Effects of Temperature on the Toxicity of Oil Refinery Waste to Algae,
W75-01408 5C

REYNOLDS, W. W.
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

RHEA, J. O.
Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

RICHTER, H.
Frictional Potential Losses and Total Water Potential in Plants: A Re-Evaluation,
W75-01617 2I

RICKARDS, W. L.
Annual Report July 1971 Through December 1972,
W75-01348 6B

RIHA, J.
Socio-Economic Problems in water Resources Development and Approaches to Their Solutions,
W75-01437 6B

RIPLEY, B. D.
Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

ROBERTSON, E.
Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

ROCCHETTI, R.
The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

RODRIGUEZ-ITURBE, I.
On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

ROGERS, R. H.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

ROTEM, J.
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

Epidemiological Patterns of Phytophthora Infestans Under Semi-Arid Conditions,
W75-01610 3F

ROTH, R. L.
Data for Border Irrigation Models,
W75-01120 3F

RUFF, J. F.
Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

RUGGLES, F.
Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

RUSSELL, R. S.
Variability of Relationships Between Transpiration, Shoot and Root Metabolism, and Nutrient Uptake in Intake Plants,
W75-01616 2D

RYAN, P. J.
Surface Heat Loss From Cooling Ponds,
W75-01296 1A

RYDING, S.-O.
Recovery of Polluted Lakes: National Swedish Environment Protection Board Research Program on the Effects of Advanced Wastewater Treatment and Sewage Diversion: Surface Water Quality of Recipients, August-October, 1972, (In Swedish),
W75-01600 5G

RYTOMAA, I.
Relationships Between the Fluoride and Magnesium Concentrations in Drinking Water and Some Components in Serum Related to Cardiovascular Diseases in Men from Four Rural Districts in Finland,
W75-01133 5C

SABHERWAL, R. K.
Some Water Resources Problems and Human Environment,
W75-01436 4A

SAFRONOVA, N. G.
Kinetics of Self-Purification of Reservoirs Containing Strontium-90 As a Result of Radionuclide Absorption by Bottom Sediments, (In Russian),
W75-01152 5G

SALAS-LA CRUZ, J. D.
Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

SALONEN, L.
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

SAMESHIMA, K.
Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

SAMET, J. H.
The Latin American Approach to the Law of the Sea,
W75-01346 6E

SAMUILOV, F. D.
Phosphorus Compounds in Corn Tissues Under Unfavorable Conditions of Moistening, (In Russian),
W75-01151 3F

SAND, P. H.
Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

SANTEFORD, H. S.
The Snow Moisture Integrator,
W75-01590 7B

SANTILLAN-MEDRANO, J.
The Chemistry and Transport of Lead and Cadmium in Soils,
W75-01335 5B

SATAROVA, N. A.
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

SAVAGE, E. S.
Engineering Approach to a Secondary Treatment System,
W75-01266 5D

SAXENA, S. K.
Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

SCHCHERBUKHA, A. YA.
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

SCHENCK, N. C.
Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

SCHERTLER, R. J.
Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

SCHETZ, J. A.
Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

SCHIMMEL, S. L.
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

SCHMID, R.
Cam in Tillandsia Usneoides: Studies on the Pathway of Carbon and the Dependency of CO2 Exchange on Light Intensity, Temperature and Water Content of the Plant, (In German),
W75-01113 2I

SCHMUGGE, T.
Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

SCHRAM, R.
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

SCHUBEL, J. R.
Preliminary Observations on the Efficacy of a Commercially Available Fungal Inhibitor and its Toxicity to Fish Eggs,
W75-01423 5C

SCHULZE-RETTMER, S.
Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

SCORER, R.
Nitrogen: A Problem of Decreasing Dilution,
W75-01502 5B

SEABROOK, B. L.
Land Application of Wastewater,
W75-01141 5D

SEAGRAVES, J. A.
Effects of Wastewater Surcharges,
W75-01330 5G

SEEGER, W. R.
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

SERRUYA, C.
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

SERRUYA, S.
Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

SERVIZI, J. A.
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

SETH, H. B. S.
Ground Water Assessment and Development in Developing Countries,
W75-01457 4B

SHAHANE, A. N.
Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

SHANHOLTZ, V. O.
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

SHARMA, R. P.
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

SHARMA, S. N. P.
Partially Penetrating Multiple-Well System in a Confined Aquifer with Application to a Relief Well Design,
W75-01295 4B

SHARP, R. P.
Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

SHIFRER, C. C.
Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

SHOBERG, R. A.
Mercury Removal from Latex Paint Waste Water,
W75-01192 5D

SHREVE, D. C.
Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

SHUMAKOV, V. S.
Effects of Effluents of the Astrakhan Pulp and Board Mill on Soil Properties (Vliyanie stochnykh vod Astrakhans-kogo Tsellyulozno-Kartonnogo Kombinata na svoistva pochv),
W75-01257 5B

SHUPPERT, J.
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

SIGLER, W. F.
Effects of Temperature on the Toxicity of Oil Refinery Waste, Sodium Chlorate, and Treated Sewage to Fathead Minnows,
W75-01333 5C

SIMMES, D. A.
Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

SINDEN, J. A.
A Utility Approach to the Valuation of Recreational and Aesthetic Experiences,
W75-01122 6B

SINGLA, O. P.
Analog Subroutines for the Finite Element Method,
W75-01320 4B

SJOBLOM, M.
Absorption from the Ambient Water and Combustion of Ethanol in Young Atlantic Salmon (Salmo Salar L.) at Different Temperatures,
W75-01501 5C

SKINNER, M. M.
Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

SLAUGHTER, C. W.
The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

SLAWSON, G. C. JR.
Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

SLUSARCHUK, W. A.
Electrical Parameters of Some Frost-Prone Soils,
W75-01595 2C

SMALL, G. G.
Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

SMALLEY, E. B.
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

SMITH, E. W.
Filtering and Concentrating Means and Method,
W75-01650 5D

SMITH, F. A.
Mercury and Selected Pesticide Levels in Fish and Wildlife of Utah: I. Levels of Mercury, DDT, DDE, Dieldrin and PCB in Fish,
W75-01420 5B

SMITH, J. L.
Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Hydrology of Warm Snowpacks and Their Effects Upon Water Delivery--Some New Concepts,
W75-01530 2C

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

SMITH, M. K.
A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

SMITH, P. J.
Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

SMITH, V. E.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

SNIDER, D. M.
An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

An Experimental and Analytical Study of Thermal Structure in Heated and Cooled Stagnant Waters,
W75-01324 5B

Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

SNYDER, J. H.
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

SOKOLOWSKA, W.
The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

SOMKO, V. A.
Determination of the Radon Content in Water by a Widely Used Instrument, (In Russian),
W75-01153 5A

SONU, J.
Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

SOPPER, W. E.
Use of Sewage Wastewater and Sludge in Revegetating Strip Mine Spoil Banks,
W75-01237 5E

SOROKO, O.
Water and Waste Flow Measurement,
W75-01262 7B

SPENCER, J. F. T.
Yeasts Occurring in the Effluent Disposal Basins of a Pulp Mill in Saskatchewan,
W75-01282 5B

SPODNIEWSKA, I.
Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

STANDER, G. J.
The International Association on Water Pollution Research,
W75-01446 5G

STEIGEN, A. L.
Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

STELTER, T. J.
Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

STEPANOVA, L. A.
Comparative Evaluation of Two Methods of Calculating Production Exemplified by the Zooplankton of Lake Ilmen, (In Russian),
W75-01394 5C

STEPPUHN, H.
Estimating True Basin Snowcover,
W75-01551 2C

STEVENSON, B. H.
Sewage Treatment Apparatus,
W75-01186 5D

STOERTZ, G. E.
Geology of Salars in Northern Chile,
W75-01351 2H

STOLZENBACH, K. D.
Surface Heat Loss From Cooling Ponds,
W75-01296 1A

STONE, A. W.
Legal Research, Writing and Drafting Toward Improving Montana Water Laws: July 1, 1968 to June 30, 1971,
W75-01406 6E

STORR, D.
A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

STRATEN, G.
Determination of the Chemical Oxygen Demand by Means of Vanadate Sulfuric Acid (Die

Bestimmung des chemischen Saurstoffbedarfs mittels Vanadatschwefelsaeure),
W75-01642 5A

STRENGER, J.
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

STROEV, S. S.
Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

STULLKEN, L. E.
Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

SUBERHOFF, K. F.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

SULLAVAN, J. N.
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

SULLIVAN, A.
Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

SUMIMOTO, M.
Color of Pulp Industry Waste Liquors. V. Contribution of Wood Components to the Color of Waste Liquors from Kraft and Sulfite Pulping (In Japanese),
W75-01271 5B

SUNDAR, A.
Use of Systems Approach in Water Resources Planning,
W75-01112 6A

SUTABUTR, P.
The Recreation Benefit of the Pa Mong Project,
W75-01445 6B

SVEHLA, R. A.
Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

SVITEK, J. F.
Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

SWARTZ, R. G.
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

SWINTON, E. A.
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

SZE, M. C.
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

TABATABAI, M. A.
Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

TAKADA, H.
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

TAM, K. C.
Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

TAM, W. C.
Digital Simulation Language for Distributed Parameter System Identification,
W75-01321 7C

TAUXE, G. W.
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

TERJUNG, W. H.
The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

THILO, L.
Determination of Groundwater Recharge with Tritium,
W75-01299 2G

THOMAS, A.
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

THOMASSON, K.
Araucanian Lakes: Plankton Studies in North Patagonia, with Notes on Terrestrial Vegetation,
W75-01479 5C

Nahuel Huapi: Plankton of Some Lakes in an Argentine National Park with Notes on Terrestrial Vegetation,
W75-01478 5C

THOMSON, D. A.
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

THORSKY, G. N.
International Cooperation in Developing Water Resources,
W75-01439 6E

TISCHLER, L. F.
Integrated Surface-Ground Water Development on a Regional Basis--The San Antonio, Texas Study,
W75-01455 4B

TOMIYAMA, T.
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
W75-01416 5C

TONINI, D.
Floods as a Supplying Factor for Water Resources,
W75-01460 4A

TORAN, J.
The Consequences of Building Dams on the Environment,
W75-01431 6G

TRAINER, F. W.
Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

TROBISCH, K.
Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

TSANG, G.
Conceptual Design of a Multipurpose Instrument for Winter Stream Metering,
W75-01587 7B

TUAN, C. H.
A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

TUCKER, J. C.
Anomalous Properties of Supercooled Water. Heat Capacity, Expansivity, and Proton Magnetic Resonance Chemical Shift from 0 to -38 (Degrees),
W75-01228 1A

TUFFEY, T. J.
A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

Zones of Nitrification,
W75-01103 5B

TVORUS, E. K.
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

UHRBERG, R.
Determination of Mercury from Lake Sediments,
W75-01598 5A

UPATHAM, E. S.
The Effect of Water Temperature on the Penetration and Development of St. Lucian Schistosoma Mansoni Miracidia in Local Biomphalaria Glabrata,
W75-01618 2I

VAAJAKORPI, H. A.
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

VALENTINE, J. P.
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

VAN DIJKEN, M.
Determination of Groundwater Recharge with Tritium,
W75-01299 2G

VAN GOOR, B. J.
Influence of Restricted Water Supply on Blossom-End Rot and Ionic Composition of Tomatoes Grown in Nutrient Solution,
W75-01612 3F

VAN LOOCK, H. J.
Estimation of Agriculture-Forestry Transition Matrices from Aerial Photographs,
W75-01231 4C

VAN METER, W. P.
Heavy Metal Concentration in Fish Tissue of the Upper Clark Fork River,
W75-01216 5C

VAN OORSCHOT, J. L. P.
Different Sensitivity of Photosynthesis and Transpiration to Some Herbicides and Transpiration Inhibitors,
W75-01615 3F

VAN SOEST, R.
Detailed Cost of Some Biological Waste Treatment Systems for the Pulp and Paper Industry,
W75-01274 5D

VAN VOAST, W. A.
Hydrologic Effects of Strip Coal Mining in Southeastern Montana - Emphasis: One Year of Mining Near Decker,
W75-01329 5B

VEITH, G. D.
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

VELEV, K.
Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

VERLOO, M.
Possibilities of the 'Carbon Rod' Technique for the Determination of Trace Elements in Water by Atomic Absorption,
W75-01619 5A

VERMA, R. D.
Interbasin Transfer of Water,
W75-01452 4A

VICKERS, R. S.
Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

VICKERS, W. W.
Polar Region Snow Stratigraphy Techniques Applied to Commercial Problems,
W75-01525 2C

VISKANTA, R.
An Analytical and Experimental Study of Combined Conduction-Radiation Energy Transfer in Stagnant Water,
W75-01206 2H

Thermal Stratification by Radiation in Surface Layers of Stagnant Water,
W75-01101 2H

VOGEL, J. C.
Determination of Groundwater Recharge with Tritium,
W75-01299 2G

VOIGTS, D. L.
Engineering Approach to a Secondary Treatment System,
W75-01266 5D

VON BROECKEL, K.
A Method for the Determination of the Caloric Content of Seston, (In German),
W75-01614 7B

VONDER HAAR, T. H.
Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

VOVK, F. I.
A Model of the Mysidae Production Process, on the Pattern of Paramysis Intermedia (Czern) in the Tsimlyansk Reservoir (In Russian),
W75-01121 2H

WAGGY, G. T.
Brine Shrimp Bioassay and Seawater BOD of Petrochemicals,
W75-01415 5C

WAGNER, J. F.
Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

WALDEN, C. C.
Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

WALKER, R. A.
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

WALLIS, C.
Water Purification Means,
W75-01193 5D

WALSH, M. A.
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

WALTER, H.
Vegetation of the Earth in Relation to Climate and Eco-Physiological Conditions,
W75-01116 2I

WALTERS, K. L.
Water in the Methow River Basin, Washington,
W75-01181 4A

WARD, W. W.
Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

WARTENA, L.
Basic Difficulties in Predicting Evaporation,
W75-01300 2D

WARWICK, R. M.
An Estimate of Benthic Macrofaunal Production in the Offshore Mud of the Northumberland Coast,
W75-01601 2L

WASSMAN, R.
Seaweed Invasion,
W75-01492 5C

WATERHOUSE, K. A.
Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

WATSON, K. K.
A Comparative Study of the Hydrology of Rabiata Pine and Eucalypt Forests at Lidsdale, New South Wales,
W75-01250 2I

WEBB, S. N.
Flood Estimation in Eastern New South Wales - A Design Method,
W75-01256 4A

WEBER, J. H.
Metal Complexes of Components of Yellow Organic Acids in Water,
W75-01331 5A

WEEKS, C. R.
Urban Water Use in Australia,
W75-01254 6D

WEEKS, W. F.
Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

WELSH, J. P.
Ice and Icebreakers,
W75-01544 2C

WENDEL, H.
Determination of Chromium in Water and Waste Water (Bestimmung des Chroms in Wasser und Abwasser),
W75-01641 5A

WENDIGGENSEN, W.
Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part I. Principle of Measurement (Lowconein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil I: Prinzip der Messung),
W75-01373 5A

Lowcon - An Instrument for Continuous Measurement of Low Fiber Concentrations. Part II. Measurement of the Fiber Content in Pulp and Paper Mill Effluents (Lowcon - ein Geraet zur kontinuierlichen Messung niedriger Faserkonzentration. Teil II: Messung des Fasergehaltes im Abwasser von Zellstoff- und Papierfabriken),
W75-01374 5A

WENDLER, G.
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

WERNECKE, R. J.
Flood Hazards in Vermont (A Strategy for Abatement),
W75-01290 4A

WEST, M. J. H.
Flood Control in Reservoirs and Storage Pounds--A Discussion,
W75-01301 4A

WESTPHAL, J. A.
Some Applications of Statistical Methods to Ground-Water Flow System Analysis,
W75-01211 2F

WETZEL, R. G.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

WHINSTON, A.
An Alternative Approach for Deriving Production and Cost Functions,
W75-01338 6A

Economics of Wastewater Treatment: The Role of Regression,
W75-01405 5D

Mass Balance and Economic Models,
W75-01388 6A

Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

WHITE, L. M.
WAMIS--An Aid in Locating Information,
W75-01219 10A

WHITEHEAD, R. T.
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

WHITMORE, C. M.
Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

WIBLE, L. F.
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

WIEDERHOLM, T.
Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

WIENER, A.
Regional Systems and Hydraulic Grids,
W75-01443 6A

WIESNET, D. R.
The Role of Satellites in Snow and Ice Measurements,
W75-01564 7B

WILDER, C. R.
Soil-Cement for Water Control Structures,
W75-01470 8F

WILHEIT, T. T.
Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

WILKINSON, R. J.
Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

WILLAND, J. H.
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

WILLIAMS, T. C.
Bermuda Tunnels for Fresh Water,
W75-01464 4B

WILLIS, R. M.
Process for Removal of Algae, Diatoms and Organic Contaminants from Water,
W75-01191 5D

WILSON, A. L.
The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

WILSON, J. H.
Freeze Crystallization of Saline Water with a Direct Contact Refrigerant,
W75-01197 3A

WILSON, J. W.
Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

Measurement of Snowfall by Radar,
W75-01559 7B

WILSON, M. F.
Long-Term BOD Determinations on Biologically Treated and Untreated Kraft Mill Effluent Discharged to Lake Saimaa, Finland,
W75-01264 5B

WILSON, T. V.
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

WINDSOR, J. S.
Multireservoir Optimization Model,
W75-01226 4A

WINSLOW, F. B.
A Stream Tracer Study Using Lithium as the Tracer,
W75-01263 5B

WINTER, T. C.
The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

WISER, E. H.
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

WOHLERS, H. C.
The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

WOJCIECHOWSKI, I.
The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

WOLFF, E. A.
The World Environment and Resources Council--Toward a Planetary Environmental Order,
W75-01438 6E

WOODWELL, G. M.
Flax Pond: An Estuarine Marsh,
W75-01513 5C

WUDIRI, B. B.
Use of Phosphoric and Sulfuric Acids to Reduce Soil Crusting and Improve Emergence of Sugarbeet (Beta Vulgaris L.) Seedlings,
W75-01386 3F

XUCLA BAS, A.
Effluent Problems and Water Pollution in the Paper Industry (Problemas y vertidos de aguas o de contaminacion de las mismas por la industria papelera),
W75-01276 5D

YANO, T.
Cancerous Disease of Porphyra Tenera and its Causes,
W75-01427 5A

YAO, K-M.
Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

YEVJEVICH, V.
Systematization of Flood Control Measures,
W75-01302 4A

YONGUE, W. H. JR.
The Effect of an Influx of New Species on the Diversity of Protozoan Communities,
W75-01486 5C

YOUNG, D. L. K.
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

YOUNG, G. J.
A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

YOUNG, H. L.
Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

YOUNG, J. L.
Effect of Pore Size on Diffusion Coefficients in Porous Media,
W75-01234 2G

The Self-Diffusion Coefficients of 45CA and 2,4-Dichlorophenoxyacetic Acid,
W75-01233 2G

YOUNG, S. R.
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

ZAJICEK, O. T.
The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

ZIMMERMAN, R.
Organizational Evaluation of Industrial Water Pollution Control in the New York Region,
W75-01129 5G

ZUELSDORF, R. J.
Financial and Institutional Arrangements for Wastewater Management - Denver SMSA,
W75-01289 5G

ORGANIZATIONAL INDEX

AGENCY FOR INTERNATIONAL DEVELOPMENT, WASHINGTON, D.C.
Water Management Problems,
W75-01434 6E

AGRICULTURAL RESEARCH COUNCIL, WANTAGE (ENGLAND). LETCOMBE LAB.
Variability of Relationships Between Transpiration, Shoot and Root Metabolism, and Nutrient Uptake in Intake Plants,
W75-01616 2D

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). INSTITUUT VOOR BIOLOGISCH EN SCHEIKUNDIG ONDERZOEK VAN LANDBOUWGEWASSEN.
Different Sensitivity of Photosynthesis and Transpiration to Some Herbicides and Transpiration Inhibitors,
W75-01615 3F

AKADEMIA ROLNICZO-TECHICZNA, OLSZTYN, KORTOWO (POLAND). INSTYTUT INZYNIERII I BIOTECHNOLOGII ZYWNOSCI.
Production of Bacterial Biomass in the Water of the Ilawa Lakes,
W75-01488 5C

AKADEMIA ROLNICZO-TECHNICZNA, OLSZTYN-KORTOWO (POLAND). INSTYTUT INZYNIERII I BIOTECHNOLOGII ZYWNOSCI.
Algae Concomitant with Spongilla (Spongilla) Lacustris (L.) Vejd. in the Krutynia River,
W75-01485 5C

AKADEMIYA NAUK SSSR, MOSCOW. INST. OF PLANT PHYSIOLOGY.
Functional Activity of Ribosomes in Wheat and Bean Plants Hardened Against Drought, (In Russian),
W75-01156 3F

AKADEMIYA NAUK USSR, KIEV. INSTYTUT ZOOLOGII.
Species, Size and Age Distribution in Northern Donets Fishes in the Area of Discharge of Warm-Water Effluents from the Lugansk Power Station,
W75-01412 5C

AKADEMIYA NAVUK BSSR, MINSK. TSENTRALNY BOTANICHNY SAD.
Effect of Moisture Content on Antibiotic Activity of Plants, (In Belrussian),
W75-01613 3F

AKTIEBOLAGET GULLHOGENS BRUK, SKOVDE (SWEDEN). (ASSIGNEE)
Precipitating Agent for Water Purification Processes, and a Method of Preparing Same,
W75-01635 5F

ALASKA UNIV., COLLEGE. GEOPHYSICAL INST.
Break-Up Characteristics of the Chena River Watershed, Central Alaska,
W75-01572 2C

ALL-UNION SCIENTIFIC RESEARCH INST. OF CHEMICAL MEANS OF PROTECTING PLANTS, MOSCOW (USSR).
Determination of Isophos-2 in Water by Thin-Layer Chromatography, (In Russian),
W75-01624 5A

ANCONA UNIV. (ITALY). FACULTY OF MEDICINE.
The Use of Chitosan Columns for the Removal of Mercury from Waters,
W75-01273 5A

ANDERSON-NICHOLS AND CO., INC., CONCORD, N.H.
Regional Water Facilities Study for Upper Valley Planning and Development Council, Lebanon, New Hampshire.
W75-01148 6D

ARIZONA UNIV., TUCSON.
Data for Border Irrigation Models,
W75-01120 3F

ARIZONA UNIV., TUCSON. DEPT. OF AGRONOMY AND PLANT GENETICS.
Use of Phosphoric and Sulfuric Acids to Reduce Soil Crusting and Improve Emergence of Sugarbeet (Beta Vulgaris L.) Seedlings,
W75-01386 3F

ARIZONA UNIV., TUCSON. DEPT. OF BIOLOGICAL SCIENCES.
Responses of Young Gulf Grunion, Leuresthes Sardina, to Gradients of Temperature, Light, Turbulence and Oxygen,
W75-01411 5C

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Eutrophication: A Mathematical Model,
W75-01385 5C

Groundwater Recharge and Quality Transformations During the Initiation and Management of a New Stabilization Lagoon,
W75-01387 5D

Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality,
W75-01395 5F

Water Quality in the Lower Colorado River and the Effect of Reservoirs,
W75-01396 5B

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
WAMIS--An Aid in Locating Information,
W75-01219 10A

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF ENTOMOLOGY.
Effect of Mosquito Control Chemicals on Aquatic Fauna,
W75-01319 5C

ASIAN INST. OF TECH., BANGKOK (THAILAND).
A Water Storage Method Based on Human Environment,
W75-01469 3B

ATMOSPHERIC ENVIRONMENT SERVICE, CALGARY (ALBERTA).
A Preliminary Water Balance Evaluation of an Intensive Snow Survey in a Mountainous Watershed,
W75-01549 2A

ATMOSPHERIC ENVIRONMENT SERVICE, DOWNSVIEW (ONTARIO). ICE FORECASTING CENTRAL.
Modern Demands on the Canadian Ice Advisory Service,
W75-01557 7B

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). BIOLOGY AND HEALTH PHYSICS DIV.
Use of Thermoluminescent Dosimeters for Studies of the Snow Cover,
W75-01583 7B

AUBURN UNIV., ALA. DEPT. OF BOTANY AND MICROBIOLOGY.
Effect of Temperature and Moisture on Cristulariella Pyramidalis,
W75-01608 3F

AUBURN UNIV., ALA. DEPT. OF CHEMISTRY.
The Riboflavin Sensitized Photoinactivation of Isocitric Dehydrogenase,
W75-01384 2K

AUBURN UNIV., ALA. DEPT. OF CIVIL ENGINEERING.
Water Treatment Sludge Filtration Studies,
W75-01392 5D

Treatability Studies of Textile-Domestic Waste Mixtures in a Completely-Mixed Bench Reactor,
W75-01393 5D

AUBURN UNIV., ALA. DEPT. OF ECONOMICS.
Economic Effects of Mercury Pollution on Commercial Fishing and Recreation-Related Business on Pickwick Lake in Alabama,
W75-01317 5G

AUBURN UNIV., ALA. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Amino Acid Composition of Freshwater Algae,
W75-01238 5C

AUBURN UNIV., ALA. DEPT. OF MECHANICAL ENGINEERING.
Rejection of Waste Heat from Power Plants Through Phased-Cooling,
W75-01391 5D

AUSTRALIAN WATER RESOURCES COUNCIL, CANBERRA.
Australian Representative Basins Programme--Progress 1973.
W75-01310 7C

Stream Gauging Information, Australia--Supplement 1972.
W75-01311 7C

AVALANCHE CONTROL CONSULTANTS, OLYMPIA, WASH.
The Computer as an Aid in Avalanche Hazard Forecasting,
W75-01555 7C

AZOV-VOLGA-DON WATER HEALTH DEPT., ROSTOV-NA-DONU (USSR). BASIN SANITARY EPIDEMIOLOGICAL STATION.
Some Problems of a Hygienic Investigation of Coastal Waters, (In Russian),
W75-01623 5A

AZOVSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ROSTOV-NA-DONU (USSR).
The Effect of Collector Drain Effluents From Rice Fields on the Zooplankton of Certain Kuban' Lagoons,
W75-01417 5C

B.C. RESEARCH LTD., VANCOUVER.
Biological Detoxification of Bleached Kraft Mill Effluent,
W75-01269 5D

Process Parameters of Foam Detoxification of Kraft Effluent,
W75-01270 5D

BAR-ILAN UNIV., RAMAT-GAN (ISRAEL). DEPT. OF LIFE SCIENCES.
Effect of Wetting Duration and of Other Environmental Factors on the Development of Stemphylium Botryosum F. Sp. Lycopersici in Tomatoes,
W75-01605 3F

BASS ENGINEERING, INC., SAN DIEGO, CALIF.
An Electro-Optical Instrument for Measuring Total Precipitation and Snow Pack Water Content,
W75-01588 7B

BENDIX AEROSPACE SYSTEMS DIV., ANN ARBOR, MICH.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W75-01515 5A

BERGEN UNIV. (NORWAY). GEOFYSISK INSTITUTT.
Chemical Composition of an Antarctic Snow Profile,
W75-01597 2C

BERGEN UNIV. (NORWAY). ZOOLOGICAL MUSEUM.
Sampling Invertebrates Active Below a Snow Cover,
W75-01649 7B

BES ENGINEERING CORP., TAIPEI, (TAIWAN).
Considerations in Selecting Water Resources Consulting Engineering Firms for Developing Countries,
W75-01450 6E

BINNIE AND PARTNERS, LONDON (ENGLAND).
Flood Control in Reservoirs and Storage Pounds--A Discussion,
W75-01301 4A

BOEING CO., SEATTLE, WASH.
Meteor Burst Communication,
W75-01593 7B

BONNEVILLE POWER ADMINISTRATION, PORTLAND, OREG.
Hungry Horse Cloud Seeding Program (Final Environmental Statement).
W75-01347 3B

BOONEVILLE POWER ADMINISTRATION, PORTLAND, OREG.
Utility of Isotope Profiling Snow Gage for Water Management,
W75-01581 7B

BRITISH COLUMBIA UNIV., VANCOUVER. WESTWATER RESEARCH CENTRE.
Information Generation and Communication to Establish Environmental Quality Objectives,
W75-01130 6G

Effluent Charges, Information Generation and Bargaining Behavior,
W75-01131 5G

BROCK UNIV., ST. CATHARINES (ONTARIO). DEPT. OF GEOLOGICAL SCIENCES.
Stream Gradient as a Function of Order, Magnitude, And Discharge,
W75-01306 2E

BROOKHAVEN NATIONAL LAB., UPTON, N.Y.
Flax Pond: An Estuarine Marsh,
W75-01513 5C

BULGARIAN ACADEMY OF SCIENCES, SOFIA. INST. OF INDUSTRIAL MICROBIOLOGY.
Content of Indole and of Aliphatic Amines in Green Freshwater Unicellular Algae from the Scenedesmus Genus,
W75-01494 5C

BUNDESANSTALT FUER GEWASSERKUNDE, COBLENZ (WEST GERMANY).
Exemplary Water Level and Runoff Measuring Devices in Mountain Water Streams (Vorbildliche Wasserstands-und Abelussmessanlagen in Gebirgswessern),
W75-01643 2E

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
International Cooperation in Developing Water Resources,
W75-01439 6E

BUREAU OF RECLAMATION, WASHINGTON, D.C. DIV. OF WATER AND LAND.
Water and the Energy Crisis,
W75-01430 4A

BUREAU OF RELAMATION, TRACY, CALIF.
A Wheeled Device for Sampling the Biota of a Concrete-Lined Canal,
W75-01487 7B

BUREAU SPORT FISHERIES AND WILDLIFE, SPEARFISH, S.D. DIET TESTING DEVELOPMENT CENTER.
Use of Dried Sludge from Paper Processing Wastes in Trout Diets,
W75-01283 5C

BUTTERWORTH (HELEN LIBBEY), SMITHFIELD, VA. (ASSIGNEE)
Littoral Flow Trap or Basin,
W75-01198 8B

CALGARY UNIV. (ALBERTA). DEPT. OF PHYSICS.
Stable Isotopes in the Study of Snow and Ice Resources,
W75-01584 7B

CALIFORNIA COOPERATIVE SNOW SURVEYS, SACRAMENTO. DEPT. OF WATER RESOURCES.
Long-Range Goal and Information Needs of the Coordinated Snow Survey Program in California,
W75-01527 7C

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
A New California Department of Water Resources Telemetry System,
W75-01552 7B

CALIFORNIA UNIV., BERKELEY. CENTER FOR REMOTE SENSING RESEARCH.
Techniques for Determining Areal Extent of Snow in the Sierra Nevada Mountains Using High Altitude Aircraft and Spacecraft Imagery,
W75-01573 7B

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL ENGINEERING.
Two Dimensional Stochastic Model of a Heterogeneous Geologic System,
W75-01399 2F

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Instrumentation for Water Quality Monitoring,
W75-01620 5A

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.
Effect of Changing Water Quality and Supply on Imperial Valley, California,
W75-01397 5G

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
Spatial Variability of Field-Measured Soil-Water Properties,
W75-01292 2G

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF COMPUTER SCIENCE.
Digital Simulation Language for Distributed Parameter System Identification,
W75-01321 7C

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF GEOGRAPHY.
The Energy and Moisture Budget of the Urban Interface as Affected by Cyclonic Storms - Phases I and II,
W75-01398 2B

CALIFORNIA UNIV., LOS ANGELES. INST. OF GEOPHYSICS AND PLANETARY PHYSICS.
Interdisciplinary Study of Lake Powell, USA: Consequences of Water Management Decisions in an Arid Region,
W75-01461 2H

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
Analog Subroutines for the Finite Element Method,
W75-01320 4B

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF BIOLOGICAL SCIENCES.
Wind-Blown Dust as a Source of Nutrients for Aquatic Plants,
W75-01483 5B

CANADA CENTER FOR INLAND WATERS, BURLINGTON (ONTARIO).
Nuclear Techniques for Snow and Ice Studies in Canadian Subpolar Regions (Devon Island),
W75-01582 7B

Conceptual Design of a Multipurpose Instrument for Winter Stream Metering,
W75-01587 7B

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Multiresidue Analysis of Fourteen Organophosphorus Pesticides in Natural Waters,
W75-01265 5A

Automated Atomic Absorption Determination of Arsenic, Antimony, and Selenium in Natural Waters,
W75-01383 5A

CANBERRA HOUSING AND CONSTRUCTION DEPT. (AUSTRALIA). MAJOR DEVELOPMENT SECTION.
Advanced Waste Water Treatment,
W75-01248 5D

Advanced Waste Water Treatment (Part II),
W75-01249 5D

CARBORUNDUM CO., NIAGARA FALLS, N.Y. (ASSIGNEE)
Water Purification Means,
W75-01193 5D

CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CONN.
Measurement of Snowfall by Radar,
W75-01559 7B

CENTRAL INLAND FISHERIES RESEARCH INST., MADRAS (INDIA).
Preliminary Studies on the Primary Production and its Relation to Fisheries of the Pulicat Lake,
W75-01105 5C

CENTRE TECHNIQUE DE L'INDUSTRIE DES PAPIERS, CARTONS ET CELLULOSES, GRENOBLE (FRANCE).
Mathematical Process Model for 'Washing-Evaporation-Biological Purification'. 2. Application to a Total System Study (Modele mathematique de fabrication 'lavage-evaporation-epuration biologique'. 2. Application a l'etude de l'ensemble),
W75-01260 5D

CHRYSLER CORP., NEW ORLEANS, LA. SPACE DIV.
Aqua-Sans Sewage Treatment System,
W75-01471 5D

CIBA-GEIGY LTD., BASEL (SWITZERLAND). AGROCHEMICAL DIV.
Multiresidue Method for the Determination of Triazine Herbicides in Field-Grown Agricultural Crops, Water, and Soils,
W75-01503 5A

CLEMSON UNIV., S.C. DEPT. OF AGRICULTURAL ENGINEERING.
Groundwater - Baseflow Relationships and Baseflow Predictions from Groundwater Levels on Piedmont Watersheds,
W75-01127 2F

COAST GUARD RESEARCH AND DEVELOPMENT CENTER. GROTON, CONN.
Ice and Icebreakers,
W75-01544 2C

COLD REGIONS RESEARCH AND ENGINEERING LAB., FAIRBANKS, ALASKA.
The Arctic and Subarctic Seasonal Snowpack: Research and Management Approaches in Alaska,
W75-01547 2C

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
On Predicting Water Runoff From a Snow Cover,
W75-01528 2C

Classification of Sea Ice Ridging and Surface Roughness in the Arctic Basin,
W75-01545 2C

Sea Ice: Scales, Problems and Requirements,
W75-01546 2C

Surface Measurements of Snow and Ice for Correlation with Data Collected by Remote Systems,
W75-01548 7B

Mesoscale Deformation of Sea Ice from Satellite Imagery,
W75-01576 7B

COLORADO STATE UNIV., FORT COLLINS.
Range of Cumulative Sums, I. Exact and Approximate Expected Values,
W75-01303 2E

Elevation and Meteorological Controls on the Density of New Snow,
W75-01538 2C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCE.
Measurement of Albedo Over Polar Snow and Ice Fields Using NIMBUS-3 Satellite Data,
W75-01537 7B

Topographic Influences on Snowfall Patterns in Mountainous Terrain,
W75-01539 2B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Water and Air Movement in Bounded Layered Soil,
W75-01204 2F

For a Modified Theory of Infiltration. 2nd Part How, (Pour une theorie modifiee de l' infiltration. 2 eme partie: Comment),
W75-01220 2G

Subsurface Drainage Solutions by Galerkin's Method,
W75-01221 2G

Systematization of Flood Control Measures,
W75-01302 4A

Clarks Fork Yellowstone River Remote Sensing Study,
W75-01462 2J

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF EARTH RESOURCES.
Deuterium in Rocky Mountain Snowpacks,
W75-01536 2C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ELECTRICAL ENGINEERING.
Airborne Profiling of Ice Thickness Using a Short Pulse Radar,
W75-01562 7B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF FISHERY AND WILDLIFE BIOLOGY.
Sublethal Effect of Malathion of Three Salmonid Species,
W75-01426 5C

COLORADO UNIV., BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH.
Avalanche Hazard Evaluation and Prediction in the San Juan Mountains of Southwestern Colorado,
W75-01554 2C

COMMITTEE ON PUBLIC WORKS (U.S. HOUSE).
Congressional Intent of the 1972 Federal Water Pollution Control Act,
W75-01345 5G

COMMONWEALTH AGRICULTURAL BUREAUX SLOUGH (ENGLAND); AND COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA).
Methods for Analysis of Irrigated Soils.
W75-01239 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA; AND AUSTRALIAN NATIONAL UNIVERSITY, CANBERRA.
On Solving the Unsaturated Flow Equation: 3. New Quasi-Analytical Technique,
W75-01240 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA).
Theoretical Discussion of Groundwater Flow Towards a Sink,
W75-01241 2F

Fruitfulness in Grape-Vines: Effects of Water Stress,
W75-01242 3F

Zinc, Cadmium, Copper and Manganese in Species of Finfish and Shellfish Caught in the Derwent Estuary, Tasmania,
W75-01243 5C

The Influence of Surfactants on Flow at Wind-Blown Water Surfaces,
W75-01244 2H

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA). DIV. OF CHEMICAL TECHNOLOGY.
Application of Total Organic Carbon Measurements and Correlations with Oxygen Demand Parameters,
W75-01245 5A

CONNECTICUT UNIV., STORRS.
Characteristic Behavior of Components of Hydrologic Cycle of the United States,
W75-01400 2A

CONNECTICUT UNIV., STORRS. DEPT. OF CIVIL ENGINEERING.
The Effect of a Municipal Effluent on the Phytoplankton Composition and Diversity of the Willimantic/Shetucket Rivers,
W75-01322 5C

COPENHAGEN UNIV. (DENMARK). FRESHWATER BIOLOGICAL LAB.
Diel Variation in Oxygen Production and Uptake in a Microbenthic Littoral Community of a Nutrient-Poor Lake,
W75-01143 5C

CORNELL, HOWLAND, HAYES AND MERRYFIELD, BELLEVUE, WASH.
I-90 Lake Washington Circulation Study.
W75-01134 5G

CROWN ZELLERBACH CORP., CAMAS, WASH.
Four Biological Systems for Treating Integrated Paper Mill Effluent,
W75-01287 5D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
Nutrient Competition and Division Synchrony in Phytoplankton,
W75-01474 5C

DEFENSE MAPPING AGENCY TOPOGRAPHIC CENTER, WASHINGTON, D.C.
Hydrologic Characteristics of Snow-Covered Terrain from Thermal Infrared Imagery,
W75-01569 7B

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Catalytic Oxidation of Phenol Dilute Concentration in Air,
W75-01207 5D

DELAWARE UNIV., NEWARK. DEPT. OF CHEMISTRY.
Blue-Green Algal Genetics: A New Methodology,
W75-01514 5C

DELAWARE VALLEY REGIONAL PLANNING COMMISSION, PHILADELPHIA, PA.
DELAWARE VALLEY REGIONAL PLANNING COMMISSION, PHILADELPHIA, PA.
The Delaware Valley Plan.
W75-01137 6D

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, AUCKLAND (NEW ZEALAND). PLANT DISEASE DIV.
Basidiocarp Development and Spore Release by Stereum Purpureum in the Field,
W75-01611 3F

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, PALMERSTON NORTH (NEW ZEALAND).
A Routine Method for the Determination of Arsenic in Plants, Sediments, and Natural Waters,
W75-01376 5A

DEPARTMENT OF THE ENVIRONMENT AND CONSERVATION, CANBERRA (AUSTRALIA).
The Flooding of Lake Pedder, Final Report of Lake Pedder Committee of Enquiry, April 1974.
W75-01315 4A

DEPARTMENT OF THE ENVIRONMENT, DOWNSVIEW (ONTARIO).
Remote Sensing Applications in Canadian Ice Reconnaissance,
W75-01570 7B

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). APPLIED HYDROLOGY DIV.
Case Study of Regional Analysis Techniques for Design Flood Estimation,
W75-01648 2E

DEPARTMENT OF THE ENVIRONMENT, OTTAWA, (ONTARIO). GLACIOLOGY DIV.
Possible Fate of Oil in the Arctic Basin,
W75-01433 5B

The I.H.D. World Glacier Inventory,
W75-01541 2C

A Data Collection and Reduction System for Snow Accumulation Studies,
W75-01550 7C

DEPAUL UNIV., CHICAGO, ILL. DEPT. OF CHEMISTRY.
Phosphorus Inputs from the Atmosphere,
W75-01199 5B

DEPAUW UNIV., GREENCASTLE, IND. DEPT. OF ZOOLOGY.
The Effects of Thermal Enrichment on the Macroinvertebrate Populations of the Wabash River,
W75-01325 5C

RNA to DNA Ratios as Indicators of Metabolic Activity in Fish Affected by Temperature,
W75-01326 5C

DESERT INST., ASHKHABAD (USSR).
Mineral and Chemical Composition of Fine-Dispersed Fractions of The Deserted Ancient Irrigation Soils in Murgab Oasis, (In Russian),
W75-01154 2G

DUNSTAFFNAGE MARINE RESEARCH LAB., OBAN (SCOTLAND).
Shallow-Water Zonation of Sea-Loch Benthos and its Relation to Hydrographic and Other Physical Features,
W75-01472 2L

EAST AFRICAN METEOROLOGICAL DEPT., NAIROBI (KENYA).
East African Rainfall: Central Tendencies and Skewness as Synoptic Indicators,
W75-01293 2B

EG AND G, INC., LAS VEGAS, NEV.
Areal Snowpack Water-Equivalent Determinations Using Airborne Measurements of Passive Terrestrial Gamma Radiation,
W75-01578 7B

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Phosphorus Model of Lake Eutrophication,
W75-01496 5C

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.
Avoidance of Aroclor (Trade mark) 1254 by Shrimp and Fishes,
W75-01421 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. MUNICIPAL WASTE WATER SYSTEMS DIV.
Land Application of Wastewater,
W75-01141 5D

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W75-01313 9D

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W75-01314 6B

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., LEXINGTON, MASS.
Application of Satellite Visible and Infrared Data to Mapping Sea Ice,
W75-01566 7C

Snow Studies Using Visible and Infrared Measurements from Earth Satellites,
W75-01567 7B

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, FLINT.
Ice Thickness and Variability on Silver Lake, Genesee County, Michigan: A Radar Approach,
W75-01542 2C

FARBWERKE HOECHST, FRANKFURT AM MAIN (WEST GERMANY).
Experiences with Dewatering of Sludges from a Purification Plant for Chemical Industry Effluent,
W75-01267 5D

FIBRACEL S.A. (MEXICO).
Problems in Treatment of Water and Solutions in a Hardboard Mill (Problematica de tratamiento de agua y soluciones en una planta de hard board),
W75-01288 5D

FISCHER AND PORTER CO., WARMINSTER, PA.
Water and Waste Flow Measurement,
W75-01262 7B

FISHERIES RESEARCH BOARD OF CANADA, WEST VANCOUVER (BRITISH COLUMBIA).
Bioassay Procedures and Sublethal Effect Studies with Full Bleached Kraft Pulp Mill Effluent and Pacific Salmon,
W75-01281 5C

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.
Arsenic in Water by Flameless Atomic Absorption Spectrophotometry,
W75-01375 5A

FLORIDA UNIV., GAINESVILLE.
Southern Corn Leaf Blight Development Relative to Temperature, Moisture and Fungicide Applications,
W75-01607 3F

FLORIDA UNIV., GAINESVILLE. COMMITTEE ON WATER NEEDS FOR CITRUS.
Water Needs of Florida Citrus,
W75-01222 3F

FLORIDA UNIV., GAINESVILLE. DEPT. OF FOOD AND RESOURCE ECONOMICS.
A Description of the Southeastern Kissimmee-Everglades Drainage Basin with Emphasis on Hydrologic-Economic Linkages,
W75-01403 6B

FLORIDA UNIV., GAINESVILLE. DEPT. OF FRUIT CROPS.
Measure of Water Stress in Citrus,
W75-01223 3F

Losses of Nutrients in Drainage Water from a Mature Peach Orchard,
W75-01224 3F

FLORIDA UNIV., GAINESVILLE. DEPT. OF PLANT PATHOLOGY.
Isolates of Penicillium, Aspergillus, and Trichoderma Toxic to Aquatic Plants,
W75-01225 5C

Survey and Evaluation of Plant Pathogens of Alligatorweed (Alternanthera Philoxeroides (Mart.) Griseb.),
W75-01323 5G

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY).
Development of International Water Law in the Lake Chad Basin,
W75-01442 6E

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). LAND AND WATER DEVELOPMENT DIV.
Function and Work of FAO in the Field of International Cooperation in Development of Water Resources for Preservation of the Human Environment,
W75-01447 3F

FOREST SERVICE (USDA), BERKELEY, CALIF. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION.
Hydrology of Warm Snowpacks and Their Effects Upon Water Delivery--Some New Concepts,
W75-01530 2C

FOREST SERVICE (USDA), DURHAM, N.H. NORTHEASTERN FOREST EXPERIMENT STATION.
The Ecosystem Concept for Determining the Importance of Chemical Composition of Snow,
W75-01535 2C

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Management of Phreatophyte and Riparian Vegetation for Maximum Multiple Use Values,
W75-01382 3B

FOREST SERVICE (USDA), PROVO, UTAH. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Ablation Characteristics of an Alpine Snowfield in Summer,
W75-01531 2C

FRESHWATER BIOLOGICAL ASSOCIATION, AMBLESIDE (ENGLAND); AND ROYAL SOCIETY AFRICAN FRESHWATER BIOLOGICAL TEAM, LAKE KATWE (UGANDA).
Oxygen Uptake, Ammonia and Phosphate Excretion by Zooplankton of a Shallow Equatorial Lake (Lake George, Uganda),
W75-01497 5C

GEOLOGICAL SURVEY, ALBANY, N.Y.
Quality of Public Water Supplies of New York, November 1970-April 1972.
W75-01170 5B

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.
Valley Fill in the Roswell-Artesia Area, New Mexico,
W75-01162 2F

Structure and Stratigraphy in the Vicinity of the Shell Oil Co. Santa Fe Pacific No. 1 Test Well, Southern Sandoval County, New Mexico,
W75-01179 4B

Ground Water in the Southwestern Part of the Jemez Mountains Volcanic Region, New Mexico,
W75-01180 2F

Map Showing Chloride-Ion Concentration in Sedimentary Rocks of Permian (Guadalupian) Age, Southeastern New Mexico and Western Texas,
W75-01352 7C

GEOLOGICAL SURVEY, BAY SAINT LOUIS, MISS.
Flood Inundation in the Southeastern United States From Aircraft and Satellite Imagery,
W75-01363 7B

GEOLOGICAL SURVEY, DENVER, COLO.
Radiochemical Monitoring of Water After the Cannikin Event, Amchitka Island, Alaska, August 1973,
W75-01172 5B

GEOLOGICAL SURVEY, DORAVILLE, GA.
Stratigraphy of an Archeological Site, Ocmulgee Flood Plain, Macon, Georgia,
W75-01365 2J

GEOLOGICAL SURVEY, HARTFORD, CONN.
Hydrogeology of Southeastern Connecticut,
W75-01165 7C

GEOLOGICAL SURVEY, LAWRENCE, KANS.
Water Resources Data for Kansas, 1973: Part 2. Water Quality Records,
W75-01160 7C

GEOLOGICAL SURVEY, LITTLE ROCK, ARK.
Drainage Areas of Streams in Arkansas, White River Basin,
W75-01183 2E

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3A,
W75-01353 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3B,
W75-01354 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3C,
W75-01355 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Fourche LaFave River, Segment 3D,
W75-01356 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3E,
W75-01357 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Petit Jean and Poteau Rivers, Segment 3F,
W75-01358 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Segment 4E,
W75-01359 5B

Waste-Load Allocation Studies for Arkansas Streams, Red River Basin, Segment 1C,
W75-01360 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, Tyronza River, Segment 5D
W75-01516 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, St. Francis River, Segment 5C,
W75-01517 5B

Waste-Load Allocation Studies for Arkansas Streams, St. Francis River Basin, L'Anguille River, Segment 5B,
W75-01518 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Bayou DeView, Segment 4B,
W75-01519 5B

Waste-Load Allocation Studies for Arkansas Streams, Arkansas River Basin, Arkansas River, Segment 3G,
W75-01520 5B

Waste-Load Allocation Studies for Arkansas Streams, White River Basin, Cache River, Segment 4C,
W75-01521 5B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County, California, 1913-68,
W75-01173 7C

An Inventory of Published and Stored Chemical Analyses of Surface Water in California, 1906-71,
W75-01178 5A

Data for Selected Water Wells, Yountville Quadrangle, Napa County, California,
W75-01366 7C

Data for Selected Water Wells, Napa Quadrangle, Napa County, California,
W75-01367 7C

Data for Selected Water Wells, Calistoga Quadrangle, Napa County, California,
W75-01368 7C

Data for Selected Water Wells, Rutherford Quadrangle, Napa County, California,
W75-01369 7C

Data for Selected Water Wells, St. Helena Quadrangle, Napa County, California,
W75-01370 7C

GEOLOGICAL SURVEY, MENLO PARK, CALIF. WATER RESOURCES DIV.
Mercury in Waters of the Western United States,
W75-01166 5B

GEOLOGICAL SURVEY OF ALABAMA, MONTGOMERY.
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W75-01350 2E

GEOLOGICAL SURVEY OF CANADA, OTTAWA (ONTARIO).
An Experimental Gamma-Ray Spectrometer Snow Survey over Southern Ontario,
W75-01577 7B

GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA.
Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma,
W75-01176 7C

GEOLOGICAL SURVEY, PUEBLO, COLO.
Water-Table Decline in the Alluvial Aquifer, Spring 1964 to Spring 1974, Upper Black Squirrel Creek Basin, Colorado,
W75-01177 7C

GEOLOGICAL SURVEY, RALEIGH, N.C.
The Hydrological Cycle--Historical Evolution of the Concept,
W75-01157 2A

Development of Hydrology in North America,
W75-01158 2A

GEOLOGICAL SURVEY, RESTON, VA.
Sediment Transport by Streams Draining into the Delaware Estuary,
W75-01161 2L

The Geologic Story of Canyonlands National Park,
W75-01163 6B

Ground Water in Haskell County, Southwestern Kansas,
W75-01174 7C

Geology of Salars in Northern Chile,
W75-01351 2H

GEOLOGICAL SURVEY, RESTON, VA. EROS PROGRAM OFFICE.
Optical Data Processing and Projected Applications of the ERTS-1 Imagery Covering the 1973 Mississippi River Valley Floods,
W75-01361 7B

GEOLOGICAL SURVEY, ROLLA, MO.
Technique for Estimating the Magnitude and Frequency of Missouri Floods,
W75-01171 4A

GEOLOGICAL SURVEY, SACRAMENTO, CALIF.
Subsidence in United States Due to Ground-Water Overdraft--A Review,
W75-01159 2F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Water Resources of the Milford Area, Utah, with Emphasis on Ground Water,
W75-01168 4B

Ground-Water Resources of the Lower Bear River Drainage Basin, Box Elder County, Utah,
W75-01169 4B

GEOLOGICAL SURVEY, ST PAUL, MINN.
The Natural Quality of Ground Water in Minnesota,
W75-01362 2K

GEOLOGICAL SURVEY, TACOMA, WASH.
Ice Sheets and Glaciers,
W75-01167 2C

Water in the Methow River Basin, Washington,
W75-01181 4A

Flow of Blue Glacier, Olympic Mountains, Washington, U.S.A.,
W75-01364 2C

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
The Anclote and Pithlachascotee Rivers as Water-Supply Sources,
W75-01164 7C

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Water Resources of Wisconsin, Trempealeau-Black River Basin,
W75-01175 7C

GEOPHYSICAL SURVEY SYSTEMS, INC., NORTH BILLERICA, MASS.
Continuous Sea and Fresh Water Ice Thickness Profiling Using an Impulse Radar System,
W75-01563 7B

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG M.B.H., NEUHERBERG BEI MUNICH (WEST GERMANY). INSTITUT FUER RADIOHYDROMETRIE.
Application of Groundwater Measurements by Means of Radioisotopes on Groundwater Exploration,
W75-01463 4B

GLATFELTER (P. H.) CO., SPRING GROVE, PA.
Ozonation of a Kraft Mill Effluent,
W75-01279 5D

GOLDEN CRESCENT COUNCIL OF GOVERNMENTS, VICTORIA, TEX.
Water and Sewer Plan for Calhoun, Dewitt, Goliad, Jackson and Victoria Counties.
W75-01136 5C

GOSUDARSTVENNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT OZERNOGO I RECHNOGO RYBNOGO KHOZYAISTVA, VOLGOGRAD (USSR).
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W75-01121 2H

GOVERNMENT INDUSTRIAL RESEARCH INST., TAKAMATSU (JAPAN).
Regeneration of Spent Granular Activated Carbon Used for Kraft Pulp Waste Treatment: Effects of Regeneration Time and Steam Quantity on Regenerated Activated Carbon (In Japanese),
W75-01275 5D

Ozone-Activated Sludge Treatment of Sulphate Pulp Waste Water: Mechanism of BOD Removal, Treatment Conditions, and Sequential Treatment (In Japanese),
W75-01377 5D

GUTTERIDGE, HASKINS AND DAVEY PTY LTD., MELBOURNE (AUSTRALIA).
Urban Water Use in Australia,
W75-01254 6D

HAENY UND CIE, MEILEN (SWITZERLAND).
Compact Waste Water Pumping Systems with High Capacity (Kompakte Abwasserpumpwerke Grosser Leistung),
W75-01628 5D

HALCROW (WILLIAM) AND PARTNERS, LONDON (ENGLAND).
An Example of the Use of Bacteriophage as a Groundwater Tracer,
W75-01291 2F

HARVARD UNIV., CAMBRIDGE, MASS. CENTER FOR POPULATION STUDIES.
Some Possibilities for International Development of the Ganges-Brahmaputra River Basins,
W75-01441 6B

HARYANA PUBLIC WORKS DEPT., CHANDIGARH (INDIA), IRRIGATION WORKS.
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W75-01436 4A

HEIDEMAATSCHAPPIJ BEHEER N.V., ARNHEM (NETHERLANDS). RESEARCH DEPT.
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W75-01300 2D

HELSINKI UNIV. (FINLAND). DEPT. OF DENTISTRY.
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W75-01133 5C

HELSINKI UNIV. (FINLAND). DEPT. OF ZOOLOGY.
Bioaccumulation and Transfer of 14C-DDT in a Small Pond Ecosystem,
W75-01236 5B

HENNINGSON, DURHAM, AND RICHARDSON, INC., OMAHA, NEBR.
Planning for Water Resource Management,
W75-01456 6B

HOCHASCHULE FUER BODANKULTURE, VIENNA (AUSTRIA). BOTANISCHES INSTITUT.
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W75-01617 2I

HOKKAIDO FISH HATCHERY, SAPPORO (JAPAN).
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W75-01477 5C

HYDROLOGIC ENGINEERING CENTER, DAVIS, CALIF.
An Assessment of Remote Sensing Applications in Hydrologic Engineering,
W75-01312 7B

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
Computer Memory Requirements for DP and DDP in Water Resources Systems Analysis,
W75-01212 4A

Computer Time Requirements for DP and DDDP in Water Resources Systems Analysis,
W75-01213 4A

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF MATHEMATICS.
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W75-01502 5B

INDIAN INST. OF TECH. KHARAGPUR. DEPT. OF CIVIL ENGINEERING.
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W75-01295 4B

INDIAN INST. OF TECH., NEW DELHI (INDIA).
Indian National Water Plan and Grid,
W75-01458 6B

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Sampling Efficiency of Four Types of Mud Bottom Samplers,
W75-01401 7B

INSTITUTE FOR SOIL FERTILITY, GRONINGEN (NETHERLANDS).
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W75-01612 3F

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W75-01424 5C

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W75-01473 5C

INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND).
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W75-01586 7B

INSTITUTE OF NUCLEAR PHYSICS AND TECHNIQUES, KRAKOW (POLAND).
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W75-01644 5A

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W75-01604 5C

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The Changes of Winter Phytoplankton in Relation to the Light Climate in the Lakes with Various Trophy,
W75-01489 5C

INTERNATIONAL BUSINESS MACHINES CORP., GAITHERSBURG.
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W75-01118 5A

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION, NEW WESTMINISTER (BRITISH COLUMBIA).
Preliminary Survey of Toxicity of Chlorinated Sewage to Sockeye and Pink Salmon,
W75-01413 5C

INTERNATIONAL POLLUTION CONTROL SYSTEMS, INC., WASHINGTON, D.C. (ASSIGNEE)
Process and Apparatus of Handling Water Which is Contaminated with an Oillike Liquid,
W75-01196 5D

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Effects of Pipe Materials on Quality of Water Samples,
W75-01627 5B

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING.
Theory of Some Free Surface Groundwater Seepage Problems,
W75-01205 2F

ITT INDUSTRIES, INC., NEW YORK. (ASSIGNEE)
Treatment for Waste Water or the Like,
W75-01194 5D

IZAAK WALTON LEAGUE OF AMERICA, ARLINGTON, VA.
A Citizen's Guide to Clean Water.
W75-01339 5G

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
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W75-01423 5C

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF EARTH AND PLANETARY SCIENCES.
The Equilibrium and Stability of Simple Marine Biological Systems. II. Herbivores,
W75-01498 5C

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Warming of the World's Waters by Man,
W75-01432 5C

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING; AND JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF POLITICAL ECONOMY.
Benefit-Cost Analysis Reconsidered: An Evaluation of the Mid-State Project,
W75-01119 6B

JOHNS HOPKINS UNIV., BALTIMORE, MD. MCCOLLUM-PRATT INST., AND JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF BIOLOGY.
Aquarium Systems for the Maintenance of Ctenophores and Jellyfish and for the Hatching and Harvesting of Brine Shrimp (Artemia Salina) Larvae,
W75-01419 8I

JRB ASSOCIATES INC., LA JOLLA, CALIF.
Development and Field Testing of a Remote Radioisotopic Snow Gage,
W75-01585 7B

KANSAS STATE UNIV., MANHATTAN. DEPT. OF INDUSTRIAL ENGINEERING.
Modeling and Optimization of Water Resources Systems --- Phase III, Stochastic Modeling and Optimization of the Walnut and Poteau River Basins,
W75-01210 4A

KANSAS UNIV., CENTER FOR RESEARCH, INC., LAWRENCE. REMOTE SENSING LAB.
Use of Radar Techniques for Sea Ice Mapping,
W75-01558 7B

KARLSRUHE UNIV. (WEST GERMANY).
The Plateau B.O.D.--Measurement and Significance (Der Plateau-BSB-Messung und Aussagekraft),
W75-01640 5A

KAZAN AGRICULTURAL INST. (USSR).
Phosphorus Compounds in Corn Tissues Under Unfavorable Conditions of Moistening, (In Russian),
W75-01151 3F

KERALA PUBLIC WORKS DEPT., TRIVANDRUM (INDIA).
Environmental Planning of an Irrigation Project in a Developing Country,
W75-01444 3F

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
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W75-01614 7B

KINNERET LIMNOLOGY LAB., TIBERIAN (ISRAEL).
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W75-01482 5C

KINNERET LIMNOLOGY LAB., TIBERIAS (ISRAEL).
The Measurement of Phytoplankton Parameters in Nature,
W75-01104 5A

Lake Kinneret Sediments: Nutrient Composition of the Pore Water and Mud Water Exchanges,
W75-01480 5C

KRANNERT GRADUATE SCHOOL OF INDUSTRIAL ADMINISTRATION, LAFAYETTE, IND.
Water Quality Control: Nonlinear Programming Algorithms,
W75-01410 5G

KYUSHU UNIV., FUKUOKA (JAPAN). DEPT. OF FISHERIES CHEMISTRY.
Algal Cancer and Its Causes-II. Separation of Carcinogenic Compounds from Sea Bottom Mud Polluted by Wastes of the Coal Chemical Industry, (In Japanese),
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W75-01427 5A

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W75-01271 5B

LAKE-PORTER COUNTY REGIONAL TRANSPORTATION AND PLANNING COMMISSION, HIGHLAND, IND.
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W75-01146 6B

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE (ENGLAND).
The 1971 Cholera Epidemic in Zaria, Nigeria,
W75-01155 5C

LOUISIANA ADVISORY COMMISSION ON COASTAL AND MARINE RESOURCES, BATON ROUGE.
Chalmette Public Hearings Testimony, (Louisiana).
W75-01344 4A

LUMMUS CO., BLOOMFIELD, N.J. (ASSIGNEE)
Treatment and Use of Waste Effluent Streams,
W75-01190 5D

MALVIYA REGIONAL ENGINEERING COLL., JAIPUR (INDIA).
Interbasin Transfer of Water,
W75-01452 4A

MARIN MUNICIPAL WATER DISTRICT, CORTE MADERA, CALIF.
Impact of Water Utility Policies on Growth Patterns,
W75-01142 6B

MARYLAND UNIV., COLLEGE PARK. WATER RESOURCES RESEARCH CENTER.
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W75-01209 9D

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Surface Heat Loss From Cooling Ponds,
W75-01296 1A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
Screening Model for Storm Water Control,
W75-01110 5D

On the Transformation of Point Rainfall to Areal Rainfall,
W75-01125 2B

Determination of Water Quality Parameters in the Massachusetts Bay (1970-1973),
W75-01511 5B

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. SEA GRANT PROJECT OFFICE.
Spring Run-Off into Massachusetts Bay, 1973,
W75-01509 5B

Dissolved Nutrient-Seawater Density Correlations and the Circulation in Boston Harbor and Vicinity,
W75-01510 2L

MASSACHUSETTS UNIV., AMHERST. DEPT. OF CHEMISTRY.
The Carbon Budget Concept: A Quantative Measure of Trophic State,
W75-01499 5C

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
The Metropolitan Sanitary District of Greater Chicago,
W75-01465 5D

METROPOLITAN WATER SEWERAGE AND DRAINAGE BOARD, SYDNEY (AUSTRALIA). DESIGN BRANCH.
Pilot Plant Evaluation of Water Treatment by Direct Filtration,
W75-01251 5F

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF PHYSIOLOGY.
Industrial and Municipal Wastes: Action of Some Water Soluble Pollutants on Fish,
W75-01215 5C

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
Organic Enrichment with Leaf Leachate in Experimental Lotic Ecosystems,
W75-01128 5C

Gull Lake: Past, Present, Future.
W75-01327 5B

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON.
The Snow Moisture Integrator,
W75-01590 7B

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON. DEPT. OF CHEMISTRY AND CHEMICAL ENGINEERING.
Reducing Water Pollution from Pulp Mill Sulfite Wastes,
W75-01200 5D

MINISTRY OF AGRICULTURE, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Evapotranspiration of Wheat, Oats and Barley,
W75-01493 2D

MINISTRY OF AGRICULTURE, TEL-AVIV (ISRAEL). DEPT. OF PLANT PROTECTION.
Epidemiological Limitations to the Forecasting of Downy Mildews and Late Blight in Israel,
W75-01606 3F

MINISTRY OF FOREST AND WATER MANAGEMENT, PRAGUE (CZECHOSLOVAKIA).
Integrated Approach to Water Resources Development in Water Scarce Countries,
W75-01454 6B

MINNESOTA UNIV., ST. PAUL. WATER RESOURCES RESEARCH CENTER.
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W75-01390 6B

MISSOURI UNIV., COLUMBIA. DEPT. OF CHEMISTRY.
Chemistry,
W75-01230 5A

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W75-01328 5C

MITRE CORP., BEDFORD, MASS.
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W75-01525 2C

MONASH UNIV., CLAYTON (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Simple Nonlinear Model for Flood Estimation,
W75-01298 4A

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W75-01329 5B

MONTANA UNIV., MISSOULA.
Channels in Ice,
W75-01543 2C

MONTANA UNIV., MISSOULA. DEPT. OF CHEMISTRY.
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W75-01216 5C

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W75-01406 6E

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Determination of the Radon Content in Water by a Widely Used Instrument, (In Russian),
W75-01153 5A

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Freeway Runoff from the I-90 Corridor,
W75-01135 5C

Quality of Local Lakes and Streams in the Lake Washington and Green River Drainage Basins,
W75-01140 5B

MUNICIPALITY OF METROPOLITAN SEATTLE, WASH. TECHNICAL SERVICES DEPT.
Control of Combined Sewer Overflow Events,
W75-01138 5G

NAGOYA INST. OF TECH. (JAPAN). MATERIALS RESEARCH LAB.
Artificial Light-Weight Aggregate From Waste Mud of Silica Sand Factories and Waste Fluid of Pulp Factory,
W75-01372 8F

NATAL UNIV., DURBAN (SOUTH AFRICA). DEPT. OF CIVIL ENGINEERING.
Multireservoir Optimization Model,
W75-01226 4A

Run Hydrographs From Poisson Generated Run Lengths,
W75-01304 2E

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Application of SLAR for Monitoring Great Lakes Total Ice Cover,
W75-01560 7B

Application of Thermal Imagery to the Development of a Great Lakes Ice Information System,
W75-01571 7C

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Polar Sea Ice Observations by Means of Microwave Radiometry,
W75-01574 7B

Microwave Signatures of Snow and Fresh Water Ice,
W75-01575 7B

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Remote Sensing and Snowpack Management,
W75-01294 2C

Electronic Measurements of Snow Sample Wetness,
W75-01591 7B

Microwave Profiling of Snowpack Free-Water Content,
W75-01592 7B

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W75-01261 5B

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W75-01380 5D

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W75-01445 6B

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Design of a Combined Sewer Overflow Regulator Concentrator,
W75-01631 5D

NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.
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W75-01564 7B

Some New Satellite Measurements and Their Application to Sea Ice Analysis in the Arctic and Antarctic,
W75-01565 7B

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The Occurrence and Movement of Liquid Water in the Snowpack,
W75-01529 2C

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W75-01425 5C

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W75-01556 7C

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W75-01299 2G

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W75-01282 5B

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Determination of Mercury from Lake Sediments,
W75-01598 5A

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W75-01264 5B

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.
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W75-01579 7B

Natural Gamma Spectral Peak Method for Snow Measurement from Aircraft,
W75-01580 7B

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Lake Ontario Snowfall Observational Network for Calibrating Radar Measurements,
W75-01561 7B

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Quantitative Method for Enumerating Salmonellae in Surface Waters, (In Russian),
W75-01622 5A

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
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W75-01540 2B

NEUSE RIVER COUNCIL OF GOVERNMENTS, NEW BERN, N.C.
Region 'P', Phase I Water Quality Management Plan,
W75-01144 5G

Region 'P', Phase II Water Quality Management Plan.
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W75-01246 6D

Problems of Liquid Waste Disposal,
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W75-01407 5D

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W75-01232 2G

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W75-01233 2G

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W75-01234 2G

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W75-01453 4A

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W75-01237 5E

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W75-01402 2H

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W75-01388 6A

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W75-01214 7B

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W75-01404 5B

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W75-01228 1A

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W75-01227 6B

PURDUE UNIV., LAFAYETTE, IND. HEAT TRANSFER LAB.
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W75-01206 2H

PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.
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W75-01124 4C

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W75-01101 2H

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W75-01324 5B

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W75-01338 6A

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W75-01405 5D

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W75-01491 5C

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W75-01490 5C

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W75-01235 5B

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W75-01208 5C

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W75-01349 6E

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W75-01619 5A

ROYAL DANISH SCHOOL OF PHARMACY, COPENHAGEN.
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W75-01506 5C

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
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W75-01534 2C

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W75-01594 2C

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W75-01595 2C

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF SOILS AND CROPS.
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W75-01102 5B

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W75-01103 5B

A Critical Analysis of Warburg Respirometry for BOD Determinations of Polluted Rivers,
W75-01217 5A

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W75-01139 5A

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W75-01618 2I

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Activated Carbon from Bark for Effluent Treatment,
W75-01284 5D

Water-Soluble Hydrocarbons from Crude Oil,
W75-01422 5B

SASKATCHEWAN UNIV., SASKATOON. DIV. OF HYDROLOGY.
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W75-01533 2C

Estimating True Basin Snowcover,
W75-01551 2C

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W75-01184 5D

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W75-01112 6A

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W75-01289 5G

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W75-01524 2C

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W75-01526 7B

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W75-01523 2C

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W75-01263 5B

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W75-01247 5B

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W75-01507 5C

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W75-01596 7B

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W75-01334 2G

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W75-01486 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPARTMENT OF PLANT PATHOLOGY AND PHYSIOLOGY.
Influence of Several Algae on 2,4-D Residues in Water,
W75-01108 5G

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AEROSPACE AND OCEAN ENGINEERING.
Penetration and Mixing of Heated Jets Injected into Waterways with Application to the Thermal Pollution Problem,
W75-01203 5B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF AGRICULTURAL ENGINEERING.
Simulations of Watershed Hydrology on Agricultural Watersheds in Virginia with the Stanford Model,
W75-01218 2A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
Water Resources, (Annual Report, Fiscal Year 1973),
W75-01316 9D

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
A New Method for Estimating Productivity in Standing Waters Using Free Oxygen Measurements,
W75-01107 5A

Continuous Automated Measurement of Rates of Photosynthesis and Respiration in an Undisturbed River Community,
W75-01505 5A

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL). DIV. OF PLANT PATHOLOGY.
Epidemiological Patterns of Phytophthora Infestans Under Semi-Arid Conditions,
W75-01610 3F

VSESOYUZNYI NAUCHNO-ISSLEDOVATEL'SKII INSTITUT TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI, LENINGRAD (USSR).
Spectroscopic Method for the Quantitative Determination of Pulp in Activated Sludge (Spektroskopicheskii metod kolichestvennogo opredeleniya tsellyulozy v aktivnom ile),
W75-01378 5A

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT VODOSNABZHENIYA, KANALIZATSII, GIDROTEKHNICHESKIKH SOORUZHENII I INZHENERNOI GIDROGEOLOGII, MOSCOW (USSR).
Determination of the Chemical Oxygen Demand of Natural and Waste Waters Containing Small Amounts of Organic Pollutants (Opredelenie okislyaemost' prirodnykh i stochnykh vod pri malom soderzhanii v nikh organicheskikh zagryaznenii),
W75-01258 5A

Sea Protection Against Contamination with Oil-Containing Waste Water,
W75-01466 5D

The Method of Reduction of Sewage Discharge into the Sea,
W75-01467 5D

VSESOYUZNYI-NAUCHNYI PLANOVII OTDEL BUMAZHNOI PROMYSHLENNOST (USSR).
Reduction of Water Consumption in the Manufacture of Boxboard and Bag Paper (Sokrashchenie vodopotrebleniya pri proizvodstve tarnogo kartona i meshochnoi bumagi),
W75-01285 3E

VYSKUMNY USTAV PAPIERU A CELULOZY, BRATISLAVA (CZECHOSLOVAKIA).
Five-Day BOD Generated During Bleaching of Pulp in the Gemer Pulp and Paper Mill (Mnozstvo BSK(5) pri bieleni papierenskej buniciny v Gemerskej Celulozke a Papierni),
W75-01381 5B

WARSAW UNIV. (POLAND). DEPT. OF HYDROBIOLOGY; AND WARSAW UNIV. (POLAND). ZOOLOGICAL INST.
Seasonal Changes of Biomass of Benthic Algae in the Littoral of Mikolajskie Lake,
W75-01504 5C

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
A Second Survey of Invertebrates and Algae Along the Intertidal Beaches of West Point, The Site of Metro's Sewage Treatment Plant, Seattle, Washington,
W75-01149 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Problems Encountered in Multidisciplinary Resources and Environmental Simulation Models Development,
W75-01500 6A

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Numerical Abundance of Dominant Copepods from the Northeast Pacific Ocean: Columbia River Effluent Area, 1963,
W75-01512 5C

WASHINGTON UNIV., SEATTLE. GEOPHYSICS PROGRAM.
A Real-Time Data Network for Avalanche Forecasting in the Cascade Mountains of Washington State,
W75-01553 7B

WATER PLANNING FOR ISRAEL, TEL-AVIV.
Occurrence of Pesticides in Selected Water Sources in Israel,
W75-01268 5B

WATER PURIFICATION CORP. OF AMERICA, WASHINGTON, D.C. (ASSIGNEE)
Irradiator for Water Purification,
W75-01189 5D

WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND).
The Absorptiometric Determination of Aluminum in Water. A Comparison of Some Chromogenic Reagents and the Development of an Improved Method,
W75-01272 5A

WAYNE STATE UNIV., DETROIT, MICH. DEPT. OF BIOLOGY.
Sulfate Uptake as a Measure of Planktonic Microbial Production in Freshwater Ecosystems,
W75-01229 5C

WEST VIRGINIA UNIV., MORGANTOWN. DEPT. OF MANAGEMENT.
Effects of Wastewater Surcharges,
W75-01330 5G

WESTERN MICHIGAN UNIV., KALAMAZOO. DEPT. OF PAPER SCIENCE AND ENGINEERING.
A Volumetric Method for the Determination of Sulfates,
W75-01259 5A

WILLIAMS AND WORKS, GRAND RAPIDS, MICH.
Bermuda Tunnels for Fresh Water,
W75-01464 4B

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Mechanical and Habitat Manipulation for Aquatic Plant Management,
W75-01481 5C

WISCONSIN UNIV. CENTER, MARINETTE.
Cooperative Community-University Water Resource Planning: An Interdisciplinary Approach,
W75-01109 6B

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Design and Construction of a Research Station for the Study of Induced Vertical Mixing in a Thermally Stratified Pond using Warm Water Discharge,
W75-01409 5B

WISCONSIN UNIV., MADISON. DEPT. OF PLANT PATHOLOGY.
The Development of Hypoxylon Canker of Populus Tremuloides: Role of Interacting Environmental Factors,
W75-01609 3F

WISCONSIN UNIV., MADISON. DEPT. OF ZOOLOGY.
Effects of a Power Plant on Zooplankton Distribution and Abundance Near Plant's Effluent,
W75-01123 5C

Lymphocystis in Age 0 Bluegills (Lepomis Macrochirus) Relative to Heated Effluent in Lake Monona, Wisconsin,
W75-01418 5C

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
Nature of Organic Derivatives of Selected Toxic Metals in Natural Waters,
W75-01201 5B

WISCONSIN UNIV., OSHKOSH.
Water Resources Management in Coastal Plain Aquifers,
W75-01459 4B

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Effects of Waste Dumping in New York Bight on the Growth of Natural Populations of Phytoplankton,
W75-01484 5C

WORLD METEOROLOGICAL ORGANIZATION, MANAGUA (NICARAGUA). CENTRAL AMERICAN HYDROMETEOROLOGICAL PROJECT.
World Meteorological Organization Activities in Central America,
W75-01449 6E

WYOMING UNIV., LARAMIE. DEPT. OF ZOOLOGY AND PHYSIOLOGY.
Primary Production and Limiting Nutrients in a Small, Subalpine Wyoming Lake,
W75-01508 5C

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Low Reynolds Number Sublimation of Blown Snow,
W75-01337 2C

Evaporation from Snowdrifts Under Oasis Conditions,
W75-01532 2C

Measuring Snowfall, a Critical Factor for Snow Resource Management,
W75-01589 7B

ACCESSION NUMBER INDEX

W75-01101 2H
W75-01102 5B
W75-01103 5B
W75-01104 5A
W75-01105 5C
W75-01106 6B
W75-01107 5A
W75-01108 5G
W75-01109 6B
W75-01110 5D
W75-01111 5B
W75-01112 6A
W75-01113 2I
W75-01114 2I
W75-01115 6A
W75-01116 2I
W75-01117 4B
W75-01118 5A
W75-01119 6B
W75-01120 3F
W75-01121 2H
W75-01122 6B
W75-01123 5C
W75-01124 4C
W75-01125 2B
W75-01126 2G
W75-01127 2F
W75-01128 5C
W75-01129 5G
W75-01130 6G
W75-01131 5G
W75-01132 5B
W75-01133 5C
W75-01134 5G
W75-01135 5C
W75-01136 5C
W75-01137 6D
W75-01138 5G
W75-01139 5A
W75-01140 5B
W75-01141 5D
W75-01142 6B
W75-01143 5C
W75-01144 5G
W75-01145 5G
W75-01146 6B
W75-01147 6F
W75-01148 6D
W75-01149 5C
W75-01150 3F
W75-01151 3F
W75-01152 5G
W75-01153 5A
W75-01154 2G
W75-01155 5C
W75-01156 3F
W75-01157 2A
W75-01158 2A
W75-01159 2F
W75-01160 7C
W75-01161 2L
W75-01162 2F
W75-01163 6B
W75-01164 7C
W75-01165 7C
W75-01166 5B
W75-01167 2C
W75-01168 4B
W75-01169 4B
W75-01170 5B
W75-01171 4A
W75-01172 5B
W75-01173 7C
W75-01174 7C
W75-01175 7C
W75-01176 7C
W75-01177 7C
W75-01178 5A
W75-01179 4B
W75-01180 2F
W75-01181 4A
W75-01182 5A
W75-01183 2E
W75-01184 5D
W75-01185 5F
W75-01186 5D
W75-01187 5D
W75-01188 8B
W75-01189 5D
W75-01190 5D
W75-01191 5D
W75-01192 5D
W75-01193 5D
W75-01194 5D
W75-01195 5G
W75-01196 5D
W75-01197 3A
W75-01198 8B
W75-01199 5B
W75-01200 5D
W75-01201 5B
W75-01202 9D
W75-01203 5B
W75-01204 2F
W75-01205 2F
W75-01206 2H
W75-01207 5D
W75-01208 5C
W75-01209 9D
W75-01210 4A
W75-01211 2F
W75-01212 4A
W75-01213 4A
W75-01214 7B
W75-01215 5C
W75-01216 5C
W75-01217 5A
W75-01218 2A
W75-01219 10A
W75-01220 2G
W75-01221 2G
W75-01222 3F
W75-01223 3F
W75-01224 3F
W75-01225 5C
W75-01226 4A
W75-01227 6B
W75-01228 1A
W75-01229 5C
W75-01230 5A
W75-01231 4C
W75-01232 2G
W75-01233 2G
W75-01234 2G
W75-01235 5B
W75-01236 5B
W75-01237 5E
W75-01238 5C
W75-01239 2G
W75-01240 2G
W75-01241 2F
W75-01242 3F
W75-01243 5C
W75-01244 2H
W75-01245 5A
W75-01246 6D
W75-01247 5B
W75-01248 5D
W75-01249 5D
W75-01250 2I
W75-01251 5F
W75-01252 5D
W75-01253 8A
W75-01254 6D
W75-01255 8D
W75-01256 4A
W75-01257 5B
W75-01258 5A
W75-01259 5A
W75-01260 5D
W75-01261 5B
W75-01262 7B
W75-01263 5B
W75-01264 5B
W75-01265 5A
W75-01266 5D
W75-01267 5D
W75-01268 5B
W75-01269 5D
W75-01270 5D
W75-01271 5B
W75-01272 5A
W75-01273 5A
W75-01274 5D
W75-01275 5D
W75-01276 5D
W75-01277 5D
W75-01278 5D
W75-01279 5D
W75-01280 5D
W75-01281 5C
W75-01282 5B
W75-01283 5C
W75-01284 5D
W75-01285 3E
W75-01286 5D
W75-01287 5D
W75-01288 5D
W75-01289 5G
W75-01290 4A
W75-01291 2F
W75-01292 2G
W75-01293 2B
W75-01294 2C
W75-01295 4B
W75-01296 1A
W75-01297 2A
W75-01298 4A
W75-01299 2G
W75-01300 2D
W75-01301 4A
W75-01302 4A
W75-01303 2E
W75-01304 2E
W75-01305 2A
W75-01306 2E
W75-01307 2D
W75-01308 8B
W75-01309 7C
W75-01310 7C
W75-01311 7C
W75-01312 7B
W75-01313 9D
W75-01314 6B
W75-01315 4A
W75-01316 9D
W75-01317 5G
W75-01318 5B
W75-01319 5C
W75-01320 4B
W75-01321 7C
W75-01322 5C
W75-01323 5G
W75-01324 5B
W75-01325 5C
W75-01326 5C
W75-01327 5B
W75-01328 5C
W75-01329 5B
W75-01330 5G
W75-01331 5A
W75-01332 5A
W75-01333 5C
W75-01334 2G
W75-01335 5B
W75-01336 5C
W75-01337 2C
W75-01338 6A
W75-01339 5G
W75-01340 6E
W75-01341 6F
W75-01342 4B
W75-01343 6G
W75-01344 4A
W75-01345 5G
W75-01346 6E
W75-01347 3B
W75-01348 6B
W75-01349 6E
W75-01350 2E
W75-01351 2H
W75-01352 7C
W75-01353 5B
W75-01354 5B
W75-01355 5B
W75-01356 5B
W75-01357 5B
W75-01358 5B
W75-01359 5B
W75-01360 5B
W75-01361 7B
W75-01362 2K
W75-01363 7B
W75-01364 2C
W75-01365 2J
W75-01366 7C
W75-01367 7C
W75-01368 7C
W75-01369 7C
W75-01370 7C
W75-01371 5D
W75-01372 8F
W75-01373 5A
W75-01374 5A
W75-01375 5A
W75-01376 5A
W75-01377 5D
W75-01378 5A
W75-01379 5D
W75-01380 5D
W75-01381 5B
W75-01382 3B
W75-01383 5A
W75-01384 2K
W75-01385 5C
W75-01386 3F
W75-01387 5D
W75-01388 6A
W75-01389 6B
W75-01390 6B
W75-01391 5D
W75-01392 5D
W75-01393 5D
W75-01394 5C
W75-01395 5F
W75-01396 5B
W75-01397 5G
W75-01398 2B
W75-01399 2F
W75-01400 2A
W75-01401 7B
W75-01402 2H
W75-01403 6B
W75-01404 5B
W75-01405 5D
W75-01406 6E
W75-01407 5D
W75-01408 5C
W75-01409 5B
W75-01410 5G
W75-01411 5C
W75-01412 5C

W75-01413 5C
W75-01414 5C
W75-01415 5C
W75-01416 5C
W75-01417 5C
W75-01418 5C
W75-01419 8I
W75-01420 5B
W75-01421 5C
W75-01422 5B
W75-01423 5C
W75-01424 5C
W75-01425 5C
W75-01426 5C
W75-01427 5A
W75-01428 6B
W75-01429 6F
W75-01430 4A
W75-01431 6G
W75-01432 5C
W75-01433 5B
W75-01434 6E
W75-01435 5B
W75-01436 4A
W75-01437 6B
W75-01438 6E
W75-01439 6E
W75-01440 6E
W75-01441 6B
W75-01442 6E
W75-01443 6A
W75-01444 3F
W75-01445 6B
W75-01446 5G
W75-01447 3F
W75-01448 6E
W75-01449 6E
W75-01450 6E
W75-01451 7B
W75-01452 4A
W75-01453 4A
W75-01454 6B
W75-01455 4B
W75-01456 6B
W75-01457 4B
W75-01458 6B
W75-01459 4B
W75-01460 4A
W75-01461 2H
W75-01462 2J
W75-01463 4B
W75-01464 4B
W75-01465 5D
W75-01466 5D
W75-01467 5D
W75-01468 5G
W75-01469 3B
W75-01470 8F
W75-01471 5D
W75-01472 2L
W75-01473 5C
W75-01474 5C
W75-01475 5C
W75-01476 5C
W75-01477 5C
W75-01478 5C
W75-01479 5C
W75-01480 5C
W75-01481 5C
W75-01482 5C
W75-01483 5B
W75-01484 5C
W75-01485 5C
W75-01486 5C
W75-01487 7B
W75-01488 5C
W75-01489 5C
W75-01490 5C
W75-01491 5C
W75-01492 5C
W75-01493 2D
W75-01494 5C
W75-01495 5C
W75-01496 5C
W75-01497 5C
W75-01498 5C
W75-01499 5C
W75-01500 6A
W75-01501 5C
W75-01502 5B
W75-01503 5A
W75-01504 5C
W75-01505 5A
W75-01506 5C
W75-01507 5C
W75-01508 5C
W75-01509 5B
W75-01510 2L
W75-01511 5B
W75-01512 5C
W75-01513 5C
W75-01514 5C
W75-01515 5A
W75-01516 5B
W75-01517 5B
W75-01518 5B
W75-01519 5B
W75-01520 5B
W75-01521 5B
W75-01522 2C
W75-01523 2C
W75-01524 2C
W75-01525 2C
W75-01526 7B
W75-01527 7C
W75-01528 2C
W75-01529 2C
W75-01530 2C
W75-01531 2C
W75-01532 2C
W75-01533 2C
W75-01534 2C
W75-01535 2C
W75-01536 2C
W75-01537 7B
W75-01538 2C
W75-01539 2B
W75-01540 2B
W75-01541 2C
W75-01542 2C
W75-01543 2C
W75-01544 2C
W75-01545 2C
W75-01546 2C
W75-01547 2C
W75-01548 7B
W75-01549 2A
W75-01550 7C
W75-01551 2C
W75-01552 7B
W75-01553 7B
W75-01554 2C
W75-01555 7C
W75-01556 7C
W75-01557 7B
W75-01558 7B
W75-01559 7B
W75-01560 7B
W75-01561 7B
W75-01562 7B
W75-01563 7B
W75-01564 7B
W75-01565 7B
W75-01566 7C
W75-01567 7B
W75-01568 7B
W75-01569 7B
W75-01570 7B
W75-01571 7C
W75-01572 2C
W75-01573 7B
W75-01574 7B
W75-01575 7B
W75-01576 7B
W75-01577 7B
W75-01578 7B
W75-01579 7B
W75-01580 7B
W75-01581 7B
W75-01582 7B
W75-01583 7B
W75-01584 7B
W75-01585 7B
W75-01586 7B
W75-01587 7B
W75-01588 7B
W75-01589 7B
W75-01590 7B
W75-01591 7B
W75-01592 7B
W75-01593 7B
W75-01594 2C
W75-01595 2C
W75-01596 7B
W75-01597 2C
W75-01598 5A
W75-01599 5G
W75-01600 5G
W75-01601 2L
W75-01602 2I
W75-01603 2J
W75-01604 5C
W75-01605 3F
W75-01606 3F
W75-01607 3F
W75-01608 3F
W75-01609 3F
W75-01610 3F
W75-01611 3F
W75-01612 3F
W75-01613 3F
W75-01614 7B
W75-01615 3F
W75-01616 2D
W75-01617 2I
W75-01618 2I
W75-01619 5A
W75-01620 5A
W75-01621 5A
W75-01622 5A
W75-01623 5A
W75-01624 5A
W75-01625 7B
W75-01626 8A
W75-01627 5B
W75-01628 5D
W75-01629 8A
W75-01630 8A
W75-01631 5D
W75-01632 5D
W75-01633 5G
W75-01634 5D
W75-01635 5F
W75-01636 2I
W75-01637 5D
W75-01638 5D
W75-01639 5G
W75-01640 5A
W75-01641 5A
W75-01642 5A
W75-01643 2E
W75-01644 5A
W75-01645 2A
W75-01646 5B
W75-01647 5A
W75-01648 2E
W75-01649 7B
W75-01650 5D

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
Cornell University, Policy Models for Water Resources Systems	W75-01110 -- 01112 01115 01117 -- 01120 01122	9
Franklin Institute (FIRL), Municipal Wastewater Treatment Technology	W75-01625 -- 01635 01637 -- 01650	25
Illinois State Water Survey, Hydrology	W75-01124 -- 01127 01202 -- 01209 01291 -- 01316 01428 -- 01471	82
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W75-01257 -- 01288 01371 -- 01383	45
University of Florida, Eastern U.S. Water Law	W75-01130 -- 01131 01339 -- 01349	13
University of Wisconsin, Eutrophication	W75-01128, 01235 01474 01476 -- 01486 01488 -- 01492 01494 -- 01500 01502 01504 -- 01515	39
University of Wisconsin, Water Resources Economics	W75-01129	1
U.S. Geological Survey, Hydrology	W75-01157 -- 01183 01211 01350 -- 01370 01516 -- 01595	129
B. State Water Resources Research Institutes		
Alabama Water Resources Research Institute	W75-01317 -- 01318 01384 01391 -- 01393	6
Arizona Water Resources Research Center	W75-01219 01385 -- 01387 01395 -- 01396	6
Arkansas Water Resources Research Center	W75-01319	1
California Water Resources Center	W75-01320 -- 01321 01397 -- 01399	5
Colorado Environmental Resources Center	W75-01220 -- 01221	2
Connecticut Institute of Water Resources	W75-01322, 01400	2
Florida Water Resources Research Center	W75-01222 -- 01225 01323, 01403	6
Illinois Water Resources Center	W75-01199 01212 -- 01213 01226	4

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes (Cont'd)		
Indiana Water Resources Research Center	W75-01101, 01214 01227 -- 01228 01324 -- 01326 01338, 01388 01404 -- 01405 01410	12
Michigan Institute of Water Research	W75-01200, 01215 01229, 01327	4
Minnesota Water Resources Research Center	W75-01389 -- 01390	2
Missouri Water Resources Research Center	W75-01230, 01328	2
Montana Water Resources Research Center	W75-01216, 01329 01406	3
New Hampshire Water Resources Research Center	W75-01331	1
New Jersey Water Resources Research Institute	W75-01102 -- 01103 01217	3
North Carolina Water Resources Research Institute	W75-01231, 01330 01407	3
Oregon Water Resources Research Institute	W75-01232 -- 01234	3
Pennsylvania Institute for Research on Land and Water Resources	W75-01332	1
Tennessee Water Resources Research Center	W75-01106	1
Utah Center for Water Resources Research	W75-01333 -- 01335 01408	4
Vermont Water Resources Research Center	W75-01336	1
Virginia Water Resources Research Center	W75-01107 -- 01108 01218	3
Wisconsin Water Resources Center	W75-01109, 01201 01409	3
Wyoming Water Resources Research Institute	W75-01337	1
C. Other		
BioSciences Information Service	W75-01104 -- 01105 01113 -- 01114 01116, 01121 01132 -- 01133 01143 01150 -- 01156 01236, 01394 01401 -- 01402 01472 -- 01473 01475, 01487 01493, 01501 01503 01596 -- 01624 01636	57

ABSTRACT SOURCES

Source	Accession Number	Total
C. Other (Cont'd)		
Commonwealth Scientific and Industrial Research Organization, Australia	W75-01239 -- 01256	18
Effects of Pollutants on Aquatic Life (Katz)	W75-01123 01411 -- 01427	18
Engineering Aspects of Urban Water Resources (Poertner)	W75-01134 -- 01142 01144 -- 01149	15
Environmental Protection Agency	W75-01289	1
Ocean Engineering Information Service (Patents)	W75-01184 -- 01198	15
Office of Water Research and Technology	W75-01210	1
Vermont Agency of Environmental Conservation	W75-01290	1

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

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